THE

REPERTORY

OF

PATENT INVENTIONS,

AND OTHER

Discoveries and Improvements

IN

ARTS, MANUFACTURES,

AND

AGRICULTURE;

BEING A CONTINUATION, ON AN ENLARGED PLAN,

OF THE

Repertory of Arts and Manufactures:

A WORK ORIGINALLY UNDERTAKEN IN THE YEAR 1794, AND STILL CARRIED ON, WITH A VIEW TO COLLECT, RECORD, AND BRING INTO PUBLIC NOTICE, THE USEFUL INVENTIONS OF ALL NATIONS.

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PATENT INVENTIONS.

No. 3. Vol. XVII. ENLARGED SERIES.—MARCH, 1851.

Specification of the Patent granted to William Brown, *of Airdrie, Lanarkshire, Electrician, and* William Williams, *the Younger, of Saint Dennis, in the County of Cornwall, Gentleman, for Improvements in Electric and Magnetic Apparatus for Indicating and Communicating Intelligence.*—Sealed March 7, 1850.

WITH AN ENGRAVING.

To all to whom these presents shall come, &c., &c.—Our invention consists,

First, of means of obtaining, what is known as a step-by-step rotating motion, to axes of apparatus for indicating and communicating intelligence.

Secondly, our invention relates to obtaining electricity for the purposes of indicating and communicating intelligence by induction.

Thirdly, our invention consists of improvements in apparatus for giving signals by sound.

Fourthly, our invention consists of means of obtaining better insulation of the wires employed in apparatus used for indicating and communicating intelligence.

Fifthly, our invention relates to connecting wires used for telegraphic purposes.

And in order that our invention may be most fully understood and readily carried into effect, we will proceed to describe the means pursued by us.

Description of the Drawings.

Fig. 1, shows a plan.

Fig. 2, an edge view partly in section.

Fig. 3, a plan view of the parts laid open; and

Figs. 4, 5, and 6, various detailed views, some of which are on an enlarged scale, of apparatus for obtaining a step-by-step rotating motion to an axis, *a*, which turns in suitable bearings at *b*, *b*. On the axis, *a*, is a tubular magnet, *c*, its poles being on either side, as hereafter explained. On the axis, *a*, is fixed the pointing hand, *d*, in front of a dial, and the arrangement or combination of electro-magnets and magnet is such that the hand can be caused to proceed step by step from and to zero in either direction, either continuously or interruptedly, these motions being obtained at pleasure; *e*, *e*, are two horse-shoe electro magnets, which cross each other, and their poles are provided each with a continuation piece, e^1, made into a section of a cylinder, and we prefer that these sections of cylinders, e^1, where they come near to each other, should be separated by a brass plate, by which means a complete cylinder will be composed with separate poles, and it is within the tubes composed of these poles of the two electro magnets that the tubular magnet, *c*, rotates by a step-by-step motion.

We would remark, that we do not confine ourselves to the use of tubular magnets for these purposes; but we prefer to employ them over any other form of magnet. We obtain tubular magnets by using hard tubes of steel; and in order to obtain the poles at the sides, we cause each such tube of steel to be placed longitudinally in contact with and between two plates of iron, one of which plates of iron is on one pole and the other plate is on the other pole of a powerful electro magnet, so that the two plates with the steel tube between them may be said to form the keeper of the electro magnet, by which means, when electric currents are passed, the steel tube will become a magnet, having its two poles on either side of its longitudinal axis; and if it be desired to use more

than two electro magnets in obtaining a step-by-step rotating action to an axis having thereon a tubular magnet, then, in place of only having two magnetic poles longitudinally in a tube of steel, that is, one on either side of the longitudinal axis, several poles may be obtained to the same steel tube by acting thereon simultaneously on several opposite sides of the tube by different electro magnets. Thus, supposing that it be desired to make a tube with four poles, then by having the tube of steel placed between four plates of iron in planes at right angles to each other, and these four plates of iron be connected, two with one electro magnet and the other two plates with another electro magnet, so as to connect the poles of the two electro magnets through the tube of steel, when electric currents are passed and two electro magnets are simultaneously formed, the tube will have four magnetic poles longitudinally thereof, and so on according to the number of poles desired to be obtained to a tube of steel. The tubular magnet, *c*, having two poles on either side of its longitudinal axis, works within the tube formed by the parts, e^1, of the two electro magnets, *e*; and these two electro magnets are in connexion with two line wires of an electric telegraph, and the apparatus is so arranged, as hereafter explained, that the poles of the electro magnets may be changed, and both magnets may be simultaneously in action on the magnet, *c*, and also so that only one of the electro magnets, and it is by these means that the axis of the magnet, *c*, may be made to make a succession of steps, so as to complete a circuit; or it may be caused to make several steps forward and then one or more back; or it may be caused to make steps of movement back and then forward, according to the arrangement of the code on the dial employed. We will now describe this action with reference to the code shown by the dial represented in the drawing; but the same may be varied.—*f*, *g*, *h*, *i*, *j*, *k*, are a series of plates which are in connexion with the various wires used, by means of the terminals, f^1, g^1, h^1, i^1, j^1, k^1. The two outermost wires are in connexion with the poles of the battery, and each of the plates, *f*, *g*, *h*, *i*, *j*, *k*, is in connexion with one of the plates, f^2, g^2, h^2, i^2, j^2, k^2, by means of the metal springs, f^3, g^3, h^3, i^3, j^3, k^3, shown by yellow lines, except that the tendency of the spring, f^3, is to remain a short distance from its plate, *f*, and it is brought into connexion therewith, when desired

to complete the circuit, by pressing on the rod, *l*, such rod, *l*, being borne upwards by means of the slight spring, l^1. The plates, g^2, h^2, i^2, j^2, have each a terminal, g^4, h^4, i^4, j^4, formed to receive wires, g^5, h^5, i^5, j^5, respectively, which wires are retained by the binding screws, as shown, and these wires, g^5, h^5, i^5, j^5, communicate with the coil wires of the magnets used. The plates, f^2, g^2, h^2, i^2, j^2, k^2, in order to their not being in metallic contact, are secured to the ivory rim, *m*, which is secured to the plate, *n*, and this plate, *n*, is supported by the pedestals, *o*, to the framing, as shown. The plates, f^2, g^2, h^2, i^2, j^2, k^2, also carry other pedestals, f^6, g^6, h^6, i^6, j^6, k^6, to which are affixed, as shown, spring connexions, f^7, g^7, h^7, i^7, j^7, k^7, for making contact with the periphery of the cylinder, *p*; and it is by means of this cylinder, *p*, that the direction and order in which the currents shall flow are regulated, so as to obtain the required step-by-step motion to the pointer, *d*. The cylinder, *p*, is formed of ivory or other suitable non-conducting material, to which are attached the metal plates, p^1, p^2, which form parts (insulated from each other) of its circumference, against which the nibs of the spring connexions, f^7, g^7, h^7, i^7, j^7, k^7, rest, as shown; p^3, are parts on opposite sides of the circumference of the cylinder, *p*, formed of ivory or other non-conducting material, the object of which pieces, p^3, is that, supposing the electricity to be flowing through the apparatus, and the nibs of two spring connexions, which by means of the wires are in connexion with one of the magnets, are resting on those parts, p^3, then the electricity will not flow through that magnet. The cylinder, *p*, is affixed to the axis, p^4, which turns in the framing, as shown, there being a handle, p^5, fixed thereon, to give the required movement thereto. In order to the cylinder, *p*, when turned, resting in the required position for the time being, the axis, p^4, carries a tooth-wheel, p^6, such wheel being cut, as shown, to receive the rollers, p^7, each of which is supported upon a lever, p^8, which turns upon a centre, p^9, and is borne against the wheel, p^6, by the spring, p^{10}.

The dial shows the order in which we arrange the letters of the alphabet and the figures employed; but we do not confine ourselves to such arrangement; and we proceed, in order to obtain the required step-by-step motion, to point to the various letters and figures in the following manner:—The spring connexions, f^7 and k^7,

from the battery, are constantly pressing against the metal surfaces, p^1, p^2, and we will suppose the spring connexion, f^7, to be in communication with the north pole of the battery; then the other spring connexion or connexions, the nibs of which for the time being are resting against that plate, p^2, will be positively electric; and the other spring battery connexion, k^7, will be from the south pole of the battery, and its nib will be resting against the plate, p^1; consequently the spring connexion or connexions which for the time being are resting on that plate, p^1, will be negatively electric; then, if we suppose the wires, h^5, j^5, to be in connexion with the horse-shoe magnet, e^3, and the two wires, g^5, i^5, in connexion with the other magnet, the arms, (3) and (4), will be north for the time being, and the opposite arms, (5) and (6), south for the time being. But in order that this may be more clearly understood, we will refer to the diagram, fig. 7, where *c* represents the steel cylindrical magnet.

The letters N and S represent the poles at the end of this magnet; and the connexion, *l*, being pressed down, so as to make contact with the battery, the electricity will flow, and the cylinder, *c*, will remain with its south pole, as shown, with the pointer pointing to the line of letters, A, B, C, D (on the dial plate, fig. 1); then, if it be required, to point to the line of letters, E, F, G. Then the cylinder, *p*, will be turned one-eighth of a revolution, by which the spring connexions, h^7, j^7, will be thrown off either of the plates, p^1, p^2; and the electricity ceasing to flow through the wires, h^5, j^5, the coils of the magnet, (3), (5), will cease to be effectively magnetic, whilst the other magnet will retain its magnetic force; but the influence of the magnet, (3), (5), being last on the cylinder, *c*, that cylinder will move partially round, so as to bring its south pole to the north pole (4) of the magnet, (4), (6), and the pointer will point to the line of letters, E, F, G. Then, if it be required to point to the line of letters, H, I, J, by turning the cylinder, *p*, another eighth of a revolution, the nib of the spring connexion, h^7, will be resting on the plate, p^1, and its opposite spring connexion, j^7, will be resting on the plate, p^2, by which the poles of the magnet, (3), (5), will be reversed, the arm (5) becoming north, by which the cylinder, *c*, will be drawn partially round, with its south pole between the two poles, (4), (5), and its pointer will point in the line of the letters, H, I, J: thus may the

various step-by-step movements be obtained to the pointing hand, and if, in place of pointing in succession to the successive line of letters, it be required to pass—say, for instance, from the line of letters, E, F, G, to the line of letters, K, L, M, then no rest will be allowed to take place at the line, H, I, J, but the movements of the apparatus will be caused rapidly to follow each other; and in like manner may other selections be made. And we would here state that, in making the selections for letters, we proceed, as stated, to cause the pointer, *d*, to move from left to right; when, however, we are selecting for figures, we proceed from right to left, and the pointer will be found, by taking the instructions above given as the basis upon which to act, to point to those lines of figures. And in order that it may be understood which of the letters or figures are intended to be selected in the different circles when the lines of figures or letters are pointed at, we have found the following rule to answer well:—That if the pointer rests without making any back movement when it comes to any line of letters or figures, then the letter or figure nearest the centre of the dial is intended to be referred to; but if, after the pointer has stopped opposite any one of the lines of letters or figures, it is by means of the apparatus, as above described, caused to make a motion back, and then resume a position against a particular line of figures or letters, then the letter or figure in the second circle from the centre is intended to be selected, and if the figure or letter in the third circle from the centre be the one intended, then the pointer should in like manner repeat such back motion, and resume its position opposite the selected line, and so on for other letters or figures in other circles should they be employed. In constructing our horse-shoe electro magnets we prefer them to be formed so that each arm is composed of two coils of wires. The first coil is formed upon the cylinder 7, and the second upon the cylinder 8, and passed over the other. The outer and inner wires are then connected together at their ends, and used as a single wire.

We would here state that, sometimes, in place of making use of an electro magnet, as above described, we simply make use of electric coils, and we have in fig. 8 shown an arrangement of electric coils, which we have found to answer the purpose. The centre part of the frame is

formed cylindrical, to receive the steel tube, *c*, such as above described, and the mode of acting with these electric coils will be the same as above described with respect to the electro magnets.

We will now proceed to describe the second part of our invention. In place of employing galvanic batteries direct to obtain currents of electricity in indicating and communicating intelligence by electric currents, we make use of electricity obtained by induction from electro magnets, formed by a coil of insulated wire upon iron or nickel charged by voltaic electricity.

We will now describe the means of sounding alarums, or communicating intelligence by sound. The first of these apparatus depends for its action on the use of what we call compound electro magnets of soft iron or nickel, one of which is on an axis and moves freely, whilst the other is fixed and has the coils of wire wound around the same, and the effect of passing a current of electricity through the same will be that both parts will be similarly converted into electro magnets. In this apparatus the one piece of soft iron or nickel forms part of the cylinder around which the coils of wire are formed. The other piece of soft iron or nickel, which is upon an axis, is bent into the form of a partial cylinder, as shown. This apparatus is shown by figs. 9, 10, 11, 12, 13, and 14, which respectively represent a plan, a side view, a horizontal section, and part of a vertical section; also details thereof on a larger scale. *a*, is the cylinder, the part, *a'*, of which is formed of soft iron or nickel. Upon this cylinder is wound the wire to receive the current; *b*, is the other piece of soft iron or nickel, which is bent into the form of a partial cylinder, and is supported upon the axis, *c*, which is formed with centre points, by which it is supported in bearings, as shown; this axis, *c*, also carries the arm, *d*, at the end of which is formed the hammer, *e*, for striking the bell, *f*. When the parts are at rest they assume the position shown by the drawings; but when a current of electricity is caused to flow through the coil of wire, the pieces of soft iron or nickel become magnetic, and the parts repel each other, so as to cause the arm, *d*, to move in the direction of the arrow. Then, when the current is broken, the hammer will fall towards and strike the bell.

The second apparatus for sounding alarums depends

for its action on the use of permanent magnets on axes working within a tube, part of which is of soft iron or nickel. The magnet in this case may be two-bar magnets bent into the form of half-tubes, with the poles reversed, and fixed on a common axis; or the magnet may be a tubular magnet, one side being magnetized by one electro magnet, and the other side of the tube rendered magnetic by means of another electro magnet. The poles of the two electro magnets, when subject to electric currents, being in contact respectively with the two ends of the steel tube on opposite sides, by which a steel tube will be converted into a magnet, each end having two dissimilar poles; and in like manner may tubes of steel have more than two magnetic poles obtained thereto, using two, three, or more electro magnets in connexion with the ends of a tube of steel.

The alarum instrument is shown at figs. 15, 16, and 17, which show respectively a plan, a front view, and a back view: *a*, being on an axis of a spring barrel of clock-work, which by the chain gives motion to the axis, *b*, a wheel on which gives motion to the pinion, *c*, on the axis, *d*, on which is the wheel, *e*, which drives the pinion on the axis, *f*, upon which are fixed the eccentrics, *g*, *g*, which carry the ends of the rods of the hammers, *h*, *h*. In this alarum there are two hammers, *h*, *h*, and their arms or rods, h^1, h^1, are formed into straps or bands to embrace the eccentrics, *g*, *g*; and when motion is given to the axis, *f*, to cause those eccentrics to revolve, the hammers will by the friction of the bands on the surface of the eccentrics be carried round with them and strike the bell, *i*, and then having struck the bell the hammers will be drawn away therefrom by the motion of the eccentrics. On the axis, *f*, is affixed the arm, *j*, which by coming against the stop, *k*, prevents the axis, *f*, revolving till the stop is removed out of the way, when the spring or other maintaining power used will cause the axis, *f*, to revolve and give motion to the hammers. The stop, *k*, is affixed to the axis, *l*, upon which is affixed the lever, *m*, which is constantly borne with its upper end towards the centre of the machine by means of the spring, *n*, acting against the under end of the lever, *m*, and it is by means of the weight, *o*, at the end of the lever, o^1, falling against the upper end of the lever, *m*, that the stop, *k*, is removed to release the arm, *j*. The lever, o^1, is affixed to the axis, *p*,

which turns in bearings carried by the frame, as shown, and to this axis, *p*, is affixed the steel cylinder, *q*, which is differently magnetized at the opposite ends of its opposite sides, and it is supported within the cylinder, *r*, which is partly formed at r^1, of soft iron or nickel, and receives the coil of wire: and when electric currents are passed through such coil the cylinder, *q*, will be acted upon to deflect the arm, o^1, into the position indicated by red lines, when the stop, *j*, will be removed; and so long as the current is flowing through the coil of wire the stop will be held away, and the bell will continue to be struck by the hammers: so soon as the circuit is broken and electricity ceases to flow through the coil, the arm, o^1, will be raised again by the light spring, *s*, carried by the lever, s^1, which at each revolution of the wheel, *e*, is raised by the pin, e^1, on that wheel coming against the arm, s^2, on the axis of the lever, s^1.

Another mode of obtaining signal or alarum apparatus consists in using a step-by-step motion, such as described under the first part of our invention, to give motion to an axis upon which is placed a worm-wheel, which by taking into a screw-wheel in the side of which is placed a pin, which each time of the revolution of the wheel will be caused to come in contact with the short end of a hammer lever, and so soon as the pin in the revolution of the wheel has passed such short end of the hammer lever, the hammer will be suddenly released and strike the bell.

We will now describe the improvements in insulating wire used for indicating and communicating intelligence. This part of the invention consists in inclosing wire to be used for telegraphic purposes within strands of yarn, in like manner to braiding or plaiting, and when several such wires are to be combined together, we in like manner combine them.

Fig. 18, shows a side view.

Fig. 19, a plan; and

Figs. 20, 21, 22, horizontal sections of apparatus which we use for this purpose. This apparatus is very similar to an ordinary braiding machine, except that the position and mode of working of some of the parts are inverted. *a*, *a*, is the framing of the machine; *b*, is the main or driving-shaft, which is driven by means of the crank-handle, b^1, or it might be by other means. Upon the

shaft, *b*, is affixed the bevelled pinion, *c*, which takes into and drives the bevelled pinion, *d*, on the upright-shaft, *e*, the lower end of which is supported in a bearing carried by the main framing, whilst the upper end is supported by a bearing carried by the lever, *f*, in order to the parts being thrown out of gear to stop the machine when any of the strands break or the bobbins become exhausted, as will be afterwards described. The upper end of the shaft, *e*, carries the pinion, e^1, which takes into and gives motion to the pinion, *g*, upon the upright shaft, g^1, which is supported in bearings carried by the framing, as shown, and at its upper end this shaft, g^1, carries the pinion, g^2, which takes into and gives motion to one of the pinions, *h*, and that pinion, *h*, communicates its motion to the other pinions, *h*, as shown. These pinions, *h*, are affixed to the spindles, h^1, which are guided by the framing, as shown, and carry the discs, h^2, by which, aided by the pieces, *i*, the motions of the bobbins, *k*, are controlled, as is well understood by persons accustomed to the use of braiding machines; *l*, is the wire, being covered, and it will be seen that this wire passes down through the machine from any suitable bobbin or otherwise, and passes under a roller, *m*, up around one of the grooves formed on the drum, *n*, upon the shaft, n^1, which receives motion from the shaft, g^1, by means of the screw-wheel, g^3, taking into the worm-wheel, n^2, on the shaft, n^1. The strands from the bobbins, *k*, are each conducted, as shown, under the pin, *o*, in the upper part of the weight, o^1, (in each of the bobbins,) thence over the pin, *p*, and down through the weight, o^1, to the wire, *l*. The weights, o^1, are each formed cylindrical, to admit of the strands passing down through them, as shown. The lever, *f*, is held in position so as to keep the pinion, *c*, in gear with the pinion, *g*, by means of the cord, *q*, which passes round the drum, *r*, which has an arm, r^1, projecting upwards so as to be held by the hook, *s*, projecting from the spindle, s^1, and this spindle has another arm, s^2, with its end bent upwards so as to be received within the slot formed in the arm, *t*, projecting from the spindle, t^1. These spindles, s^1 and t^1, have each an arm, s^3, t^2, which projects into the machine so as to be in the way of either of the weights, o^1, should either of the strands break or the bobbins become exhausted, thereby allowing either of the

weights to descend, and the spindles, s^1, t^1, are connected together, as described by means of the arm, s^2, t, in order that either being acted upon by a falling weight may more quickly withdraw the hook, s, and release the arm, r^1, and consequently the lever, f, which will then be forced outwards by means of the spring, u, and thus withdraw the pinion, e^1, from gear with the pinion, g, and stop the machine.

In covering a single wire we prefer to combine gutta percha with the strands, and for this purpose we make use of the trough, v, which is formed with a jacket, for the purpose of receiving steam through the pipe, v^1, by which the gutta percha will be kept in a soft state, so as readily to combine with the wire, and the strands to form a coating thereto.

In combining several wires we use a machine similar to the one just described for coating a single wire, but of larger dimensions, and we pass the several wires down the tube, a^1, and keep the several covered wires from coming in contact with each other by means of other strands or cords, which form a centre; and such centre cords or strands, and also the covered wires, are kept in their relative positions by passing through guide-holes formed in plates supported at each end of the tube, a^1, and the strands are platted or braided on the outside of such combined wires and strands, in like manner to what has already been described with respect to a single wire. And having covered in this manner the combined strands and wires we again pass them through a similar machine and obtain another covering of yarn, but in this case we make use of vegetable pitch in place of gutta percha for coating the material. And we prefer in like manner to cover the wires a fourth time with coil, saturating it at the same time with mineral pitch.

We will now describe the fifth part of our invention.

Fig. 23, shows two views of parts of an electric telegraphic wire, which are connected by means of the screw connexion, A, which is of the same metal as that composing the two pieces of wire, B, B. The connexion, A, which acts as a nut, is formed with a screw, in its length corresponding with the male screws on the ends of the wires, and we prefer that the thread on the wires should not be continued so far along the wires as to be the length of the connexion, A, and then, when the connexion is applied

the ends of it may by pressure be brought in close contact with the wire.

Fig. 24, shows another mode of forming a connexion. In this case, the ends of the wire, B, B, are riveted into the tubes, C, C, one of which is formed with a male, and the other, with a female screw, by which they are united.

Having thus described the nature of our invention, and the manner in which the same is to be performed, we would have it understood that we do not confine ourselves to the details as herein given, so long as the peculiar character of any part of our invention be retained.

But what we claim is,

First, the means of obtaining a step-by-step rotating action to axes by means of the combined action of electro magnets and magnets.

Secondly, we claim the transmitting of electric currents by induction from an electro magnet formed by a coil of insulated wire upon iron or nickel charged by voltaic electricity.

Thirdly, we claim the means of giving signals by sound and sounding alarms, herein explained.

Fourthly, we claim the causing wire used for electric telegraphic purposes to be covered for the purpose of insulating the same, in the manner herein described.

Fifthly, we claim the modes of connecting wires used for telegraphic purposes, as described.—In witness, &c.

William Brown.
William Williams.

Enrolled September 7, 1850.

Specification of the Patent granted to Charles Vignoles, *of Trafalgar-square, in the County of Middlesex, Civil Engineer, for an improved Method of Preparing or Manufacturing Peat or Turf for Fuel.*—Sealed September 10, 1849.—(Communication.)

WITH AN ENGRAVING.

To all to whom these presents shall come, &c., &c.—My invention has for its object to subject peat or turf to

a certain high temperature in such a manner as to deprive it of the whole, or nearly the whole, of the water which it naturally contains, and, by the continuance of the same process, to convert the peat or turf into peat or turf-charcoal, or coke. One of the most important peculiarities of this invention is, that by the mode of applying heat to effect the objects herein proposed, little, if any, of the peat or turf is burnt to ashes and wasted, and that the heat most proper for the best results as to the quality of the turf or peat-charcoal, or coke, is with certainty commanded.

Turf-charcoal, sometimes called peat-coke, has been heretofore usually obtained by some direct application of fire-heat, as by the operation called "stiffling," or by carbonization in close vessels or retorts, or in various forms of furnace or oven, none of which methods possess the advantages above alluded to.

The following is a description of the general nature of this improved method of carbonization, for effecting which various forms of apparatus may be contrived.

The peat or turf, extracted from the bog by any of the usual methods, and dried in pieces of any convenient size, either by exposure to sun and air, or by artificial heat, or by both methods, is placed in an iron vessel, of large capacity, called the "carbonizing vessel." Steam, generated in any form of boiler, at a pressure therein of from forty-five to sixty pounds per square inch or upwards, above that of the atmosphere, is permitted to escape thence, and to pass into and through a number of tubes of iron or other fit material, heated to a bright-red heat, by being placed in a furnace, or into and through any other suitable contrivance, by which the steam, issuing from the boiler, shall, without losing its pressure (as therein), acquire an additional temperature, such that, on being permitted to escape from the heating-vessel, which I shall denominate "the coil," it shall have acquired a temperature equal to that of the melting point of tin, or even that of lead, or of from 450 to 460 degrees of Fahrenheit, or thereabouts.

The surface of the coil, receiving heat from its furnace, should be proportioned to the generating power of the steam-boiler, which may be done by gradually adjusting the surface of the coil, if not found proportioned in the first instance, so as to be capable of so elevating the tem-

perature of all the steam the boiler can continuously supply at full pressure.

The steam, thus highly heated, or, as it has been sometimes called, "surcharged," is permitted to pass into the large vessel containing the dried, or partially dried, peat or turf. The effect of its contact therewith is rapidly to withdraw moisture in the state of steam from the peat or turf, which steam is permitted to escape from the vessel containing the latter, and which I call the "carbonizing vessel;" and as it is desirable that a pressure above that of the atmosphere should be maintained in this vessel, the steam or vapour, thus escaping from it (being that originally from the boiler, or part of it, and also that carried off from the peat or turf), may be advantageously used as a source of power, and applied either for the purpose of preparatory desiccation of the peat or turf (as hereinafter more particularly referred to), or for any other purpose.

After this drying process has gone on till the peat or turf, despoiled of nearly all its moisture, the former begins to be charred or carbonized by the steam at the high temperature at which it is admitted into the carbonizing vessel, and in proportion as the de-hydration of the peat or turf advances, so does the temperature of the interior of the carbonizing vessel increase, until it approaches closely to that of the steam in the coil, which must be sufficiently high for the perfect carbonization of the peat or turf. The process of passing this hot steam through the turf within the carbonizing vessel is thus continued until the whole of the turf or peat it contains is found to be reduced to a black substance, retaining the forms nearly of the original masses, but now almost a vegetable charcoal or coke.

In this state the product of the carbonization is liable to spontaneous combustion, if withdrawn while still hot and exposed to the common air. To avoid this, it may be left to cool in the carbonizing vessel; but, to save time and cost, it is better to withdraw it quickly, or let it fall therefrom, into an iron box of sufficient capacity; to cover it closely therein, and then to fill the box with low-pressure steam once or oftener, and so let the charred turf or peat remain until it has got quite cold.

The turf-coke, or charred peat, thus prepared, may be applied to all purposes for which such fuel has been heretofore used, and from its great superiority to such fuel as

made by any previous process, it is applicable to many other purposes also; as, for example, to metallurgic operations, and to locomotion by steam on land or water.

The following is a minute description of the form of apparatus which has been found, on actual trial, to answer well for carrying through this process, and which I describe as the best with which I am at present acquainted; but I do not limit myself to this or to any other particular form of apparatus.

In the drawing accompanying this, fig. 1 shows a sectional plan of the whole system of apparatus.

Fig. 2, a vertical section of same through the lines, A, B, and partial elevation of the front, C, D.

The vertical section of the steam-boiler is through the line, A, B; the vertical section of the carbonizing vessels through the same line, A, B, and the horizontal section of the carbonizing vessels numbered 1, 2, 3, 4, 5, 6, through the plane marked in vertical section by the line S, T, and the horizontal section of the carbonizing vessels numbered 7, 8, 9, 10, 11, 12, through the plane marked by the line U, V: *a*, is a cylindrical steam-boiler, with a flue through the interior, set in brickwork in the usual way, and provided with proper flues. On the right and left of this boiler are placed two complete sets of carbonizing vessels, and as these are perfectly similar, and intended to be worked alternately, it will be sufficient to describe one of them, viz., the set numbered 1, 2, 3, 4, 5, 6. Each of these carbonizing vessels is a cylinder of boiler plate, with its axis vertical. The lower part of the vessel being conical, and provided at bottom with a steam-tight man-lid, or door for the emission of the charred peat, and the upper part being of a dome form, and provided with another somewhat similar man-lid for the introduction of the peat. These vessels are all set in brickwork, and provided with flues round their exterior, through which the heat escaping from the flues of the steam-boiler may be conducted round any one or more of them in succession, for the purpose of as much as possible preserving their internal heat from being lost; small separate fires may be used for this purpose, if thought desirable. These six cylinders are so arranged as to have a space in the midst of them for the heating coils of iron pipes, marked H and I. These coils consist of two distinct sets or series of parallel tubes of malleable iron, or other suitable mate-

rial, laid parallel and horizontal in the furnace for heating them, and which tubes are connected throughout, their ends being screwed into connecting-pieces. H is the upper, I the lower series of pipes in figs. 1 and 2. At the end of the coil farthest from the fire-grate, E, is placed an arrangement of valves, or cocks (which must be so constructed as to be competent to withstand the high temperature and pressure of the surcharged steam), such that the steam from the boiler, *a*, may be admitted or withheld from the coils, and that the steam, after having been heated in the first series of pipes of the coil, may be permitted to issue into any one or more of the carbonizing vessels, and having lost heat and gained water by absorption from the peat therein, may be passed back thence into the second series of pipes of the coil (viz., the lower of the two as placed in the furnace to be again heated, or "revivified"), and then again passed into one other or more of the carbonizing vessels.

Three carbonizing vessels are usually worked together, and while three are in operation, the other three may be either in progress of being filled or of being emptied.

Supposing the whole of the vessels, 1, 2, 3, 4, 5, 6, already filled with turf, and steam up in the boiler, *a*, and the coils at a bright red heat, the steam from the boiler is turned on to the uppermost series of pipes of the coil, and thence into the carbonizing vessels, Nos. 1 and 2, and thence back again into the second series of coils, and from these into the carbonizing vessel, No. 3; when the process of carbonization is complete in all three, which is known by the disappearance of steam issuing from the escape-pipes, marked *v*, *v*, in fig. 2 (vertical section), and by the issue therefrom of the peculiar odour of charring turf, then the process is stopped as regards these three vessels, and trial is made as to whether the whole of the turf therein be fully carbonized; and if this is the case, the operation is commenced in the same way with the vessels, 4, 5, and 6, and the charred turf or peat is now let fall from each of the vessels, 1, 2, and 3, by the man-lids at the bottom, into the cooling-boxes beneath, marked *p*, and a portion of steam from the boiler, *a*, is turned on into each, by a pipe provided for this purpose, from the boiler, but which, to avoid confusion, is omitted in the drawings. When the charring operation is complete in the vessels, 4, 5, and 6, the same is done by their contents.

Meanwhile, the carbonizing vessels, 7 to 12, may be in progress of filling.

This describes the entire course of operations, and the best form of apparatus with which I am at present acquainted, so far as the carbonizing is concerned.

It remains to describe that part of the apparatus which at present I consider best for effecting a previous desiccation of the turf or peat, by taking advantage of the power derivable from the steam or vapour escaping from the carbonizing vessels.

The steam issuing from the escape-pipes, *v*, *v*, passes directly into the cylinder of a condensing steam-engine, Y, which, however, is also provided with a separate steam-boiler, X, so that at any time it may be kept at work thereby, should there not be a sufficient supply of vapour or steam from the carbonizing vessels. The steam-pipes, throttle-valves, &c., being arranged suitably for this change of source of steam for the condensing-engine being quickly made. Z, is a large fan, for producing a blast of air, which is propelled in large volume, but with a low velocity and pressure, through a large coil of pipes of cast-iron or other suitable material, at M, placed in a furnace, and heated to a temperature below that of redness, so as to warm and dry the air passed through, in the same way as commonly practised in providing the hot blast for iron-works. The air thus warmed, which must not exceed 250 degs. Fahrenheit in temperature, is passed from the coil into the one extremity of either of the two parallel vaults at N, N, which may be of any convenient length (I prefer about 100 feet), and traversing the whole length of either escapes by apertures in the doorway by which that end is closed, the near end being also closed by similar doors, but without perforations.

A railway traverses the whole length of each of these vaults (which are, of course, built on the surface of the ground, or nearly so); upon this the turf, previously air-dried upon the bog, is transferred in suitable open corves, or waggons, into the vault, the waggon almost filling its cross section.

As many of these as can stand therein are permitted to remain for such time as may be found necessary, to drive off the greater portion of the moisture that the turf or peat contains, by the passage over and amongst the corves of turf, of the dry warmed air from the fan and coil.

When the full of this vault of turf has thus become dry, the corves are rolled out along the line of railway, towards the carbonizing apparatus, and on arriving at the points, o, o, are received upon a lift, also set in motion by the engine, and by which apparatus they are raised to the level of the stage on the top of the carbonizing vessels, for the purpose of filling the latter, so that the two vaults are thus used alternately filling and emptying.

For the more convenient discharge of the corves (which may be constructed of rod-iron, or of wattles or basket-work, and fixed to or placed on a frame with four wheels), their bottoms being made to drop with hinges, in the manner commonly adopted for coal-waggons, so that, on withdrawing a bolt, the turf shall drop out below, the corve having been first lifted up to the level of the stage above the carbonizing vessels.

It is not essential to this improved process of carbonization that the above-described process of prior desiccation by dry heated air should be applied, and occasionally, in very dry seasons, it may be with advantage omitted; but whenever the quantity of hygrometric moisture in the peat is considerable, it will be found attended with a great economy of fuel and time, to previously dry it thus, rather than to produce the desiccation wholly by the surcharged steam in the carbonizing vessels.

In certain cases it may be desirable, previously to the application of any of the preceding operations to the peat or turf, to get rid of, or express therefrom, a certain proportion of the water which it may contain, by the use or adoption of the following new method of expressing or removing such water.

The peat or turf, in its wettest state, is usually found in the condition of a semi-fluid pulp or mud; as, for example, that from which "hand-turf" is made in Ireland and elsewhere. When extracted from the bog in a more consistent or fibrous condition, it may be readily reduced to the above state of a nearly homogeneous mud by the operation of edge-stones, or of a pug-mill, or other similar well-known machinery for separation and subdivision of such materials.

The peat or turf thus found or prepared, and still containing its large proportion of water, or bog-water, is thrown in mass into a cylindrical drum-shaped vessel, divided, if necessary, into compartments, which is caused

to revolve with great rapidity upon its axis; the velocity requisite being such as shall drive off the water or other fluid from the solid parts of the peat or turf by centrifugal force. I prefer that the axis of this cylindrical vessel should be placed vertically, that the diameter of the cylinder should be from six to ten feet, and its depth from one and a half to two and a half feet.

The external surface of the cylinder is composed of fine wire gauze or of perforated sheet metal, or other reticulated or perforated material, whose apertures shall be of such a size as not to permit the particles of peat or turf to pass through them (in any considerable degree), but shall permit the water, or bog-water, with which they are in contact, to become separated by passage through such apertures.

When rapid rotation is given to the cylindrical vessel thus formed, and containing the peat or turf in its state of pulp or mud, the latter is rapidly driven outward against the interior surface of the perforated sides of the cylindrical revolving vessel, by reason of that resolution of forces, usually known to mechanics as the "centrifugal force." This dwellant force, acting not only upon every particle of the peat or turf, but simultaneously upon every particle of water or other fluid with which they are mixed, gradually separates the greater portion of the fluid from the solid particles; the former passing through the perforated sides of the revolving cylinder, and the latter remaining within it.

As soon as this process, for expressing or separating the water or other fluid from the peat or turf, has dried it so that it has become a coherent, consistent mass, it is removed from the interior of the cylinder, and by any convenient method, whether by hand or machinery, is separated or moulded into blocks or junks of sizes most convenient for the evaporation of its remaining water, or for such subsequent operations as may be in view.

The apparatus in which this operation is to be performed may be constructed in various ways. The axis of the revolving vessel may be vertical or otherwise, and the vessel may be of other forms than cylindrical; I do not, therefore, claim any particular form or construction of such apparatus. And whereas such apparatus, or apparatus upon the same principle of action, has been, I believe, already proposed or used for separating fluids

from woollen, cotton, and other stuffs, I here claim only the application of this particular method of separation of water or fluids from solids, to the partial drying of peat or turf, in the way above described; the essential principle or peculiarity of the same being the application of the centrifugal force, resulting from rapid rotation, to the gradual expression of the fluid mixed with the solid particles; and the peculiar value of this method being, that by it the several well-known difficulties, inconveniences, and loss of time, incident to all hitherto known or practised methods of partially drying wet peat or turf by direct mechanical compression, are avoided.

The arrangements and apparatus described are such as have been found to answer well in practice; but I desire to be understood, that I do not confine myself to the same in all their details, which admit of being varied in many immaterial particulars. The improvements to which I lay claim, as constituting the said invention, are as follows, viz.:—

First, I claim the manufacture of fuel of a quality approximating to coal or charcoal from crude peat or turf, by subjecting the same, in close vessels, to the action of steam, generated under pressure, and then passed through hot coils of pipes, as before described.

Second, I claim the subsequent employment of the steam, which has been used in the said process, to effect the preparatory desiccation of fresh supplies of peat or turf, in the manner before described.

And, lastly, I claim the use and application to the partial drying of peat or turf, of any machinery or apparatus, the mode or principle of whose action shall be that of separating the fluid from the solid particles thereof, by causing both to be pressed against perforated surfaces by centrifugal force.—In witness, &c.

CHARLES VIGNOLES.

Enrolled March 10, 1850.

Specification of the Patent granted to HENRIETTA BROWN, *of Long-lane, Bermondsey, Widow, and Executrix of the late Samuel Brown, for Improvements in the Manufacture of Metallic Casks and Vessels.*—Sealed July 17, 1850.—(Communicated from my late Husband.)

WITH AN ENGRAVING.

To all to whom these presents shall come, &c., &c.—The invention consists of the means of fixing the heads or ends of metallic casks and vessels, and also of means of connecting parts of metal vessels. And in order that the same may be most fully understood and readily carried into effect, I will proceed to describe the means pursued by me, first remarking that the means now to be described of fixing heads of casks and bottoms, or ends of other metal vessels, are improved means to be used in place of those shown and described in the specification of a patent granted to my late husband.

Description of the Drawing.

Fig. 1, shows the section of the upper and lower part of a metal can, the bottom and the neck being fixed according to the invention; and in like manner to that shown for fixing the bottom of a can, are the heads of a cask or the bottoms of other vessels to be fixed, and such fixing is done by pressing or forming the two thicknesses of metal into a grooved or corrugated form, as shown at *a*, *a*. And for this purpose two rollers are used, such as are shown at *b*, *c*, the one having a groove and the other a projection around it. Supposing the head of a cask or the bottom of a metal can or vessel has been driven into its position, the two thicknesses of metal are to be placed between the rollers, *b*, *c*, which are to be pressed together, and they will by their rotation cause the two thicknesses of metal to be corrugated, and thus will the heads of casks or bottoms of other metal vessels be held securely in their places, and when the same are to be fluid-tight, the joint is to be dipped into molten tin or soldered, in like manner to what heads of casks and bottoms of other metal vessels which have

been driven in and riveted, have heretofore been rendered fluid-tight. By thus corrugating the two thicknesses of metal not only will the heads or bottoms be fastened, and the rivets heretofore used for this purpose be saved, but an additional stiffness will be obtained to that part of such vessels. *d*, is the neck of the can, which is fixed in a similar manner, that is, by corrugating the two thicknesses of metal; for this purpose the tubular neck, *d*, is driven into a tubular portion of the metal of the upper part of the can, and then one roller of a suitable size being within the neck, and another exterior of the neck, the two thicknesses of metal will by their rotation be corrugated, as shown, and thus will the neck be made secure and the metal stiffened by being corrugated, and the joint is to be made fluid-tight by tin or solder.

Having thus described the nature of the invention, and the manner of performing the same, I would have it understood that although I have only shown a single corrugation I do not confine myself thereto, as more may be employed.

But what I claim is,

The causing heads of casks and bottoms of vessels to be fixed, and other parts of iron vessels to be joined by corrugating the two thicknesses of metal.—In witness, &c.

HENRIETTA BROWN.

Enrolled January 17, 1851.

Specification of the Patent granted to GEORGE DUNBAR, *of Paris, for Improvements in Suspending Carriages.* —Sealed July 23, 1850.

WITH AN ENGRAVING.

To all to whom these presents shall come, &c., &c.—My invention has for its object suspending carriages from the axle by flexible bands, braces, chains, straps, or cords. And in order that the invention may be most

fully understood and readily carried into effect, I will proceed to describe the means pursued by me.

Description of the Drawing.

Fig. 1, shows a side view of a carriage suspended, according to my invention.

Fig. 2, also shows a side view of a carriage suspended, according to my invention; the means resorted to in the two cases differ somewhat in the details, but they are alike in principle, that is, in both cases a strap, brace, band, chain, or cord on either side of the carriage is fixed to the axle, *a*, and the carriage is suspended from such axle by means of the bands, braces, cords, chains, or straps. Hence, in both cases, the suspending of the carriage is by flexible means.

In fig. 1, on each side of the carriage is placed what may be called a double strap, band, or cord, *b*, which is fixed to the axle, and in order to adjust the position of the parts a screw and nut, *c*, is used to adjust the position of the lever, *d*, to which the flexible strap, band, or cord is attached, as shown.

In fig. 2, the flexible suspending bands are adjusted by barrels, *d*, with ratchet wheels and catches, as shown.

I would remark that the details herein given may be varied, I do not therefore confine myself to the detail herein given, so long as the peculiar character of my invention be retained.

And I would also state that the form of the carriage to which my invention is to be applied may be varied, according to the object for which it is intended to be applied.

Having thus described the nature of my invention, and the manner in which the same is to be performed, I would have it understood that

What I claim are the means herein described of suspending carriages.—In witness, &c.

GEORGE DUNBAR.

Enrolled January 23, 1851.

Specification of the Patent granted to ROBERT RUMNEY CRAWFORD, *of Warden Paper Mill, in the County of Northumberland, Paper Maker, for An Improvement in Drying Paper.*—Sealed July 10, 1850.

WITH AN ENGRAVING.

To all to whom these presents shall come, &c., &c.—My invention comprises a new mode of drying paper, chiefly after it has been sized, and this object I effect in the various ways herein described.

The plan which I adopt for drying paper in the web, or in long lengths, consists of a series of flat tubes, through which the paper, conducted by tapes, is passed, and in its progress through these tubes it is subjected to a stream of air, (warm air I prefer,) which is forced through the tubes by a fan or other machine, which is or may be used for blowing air or for exhausting air.

Fig. 1, represents a side elevation of the machinery I have found to answer the purpose.

Fig. 2, a front elevation of the same.

Fig. 3, a longitudinal section.

Fig. 4, a cross section at A, B, on fig. 3.

a, a^1, a^2, a^3, a^4, a^5, a^6, a^7, a^8, a^9, a^{10}, a^{11}, fig. 3, are rollers of wood for conducting the paper and tapes through the tubes.

b, b^1, b^2, b^3, and b^4, fig. 3, are the tubes (which I prefer made of sheet zinc) supported by wood framing stiffened by ledgers, shown at *c*, *c*, *c*, *c*, *c*, *c*.

d, *d*, fig. 3, represent the air-boxes for feeding the tubes, and *e*, *e*, the trunks for conveying the air from the blowing machine to the air-boxes, *d*, *d*.

Motion is given to the rollers, *a*, *a*, by the driving-shaft, A, and band-wheels, C and D, figs. 1 and 2. A crossed strap is passed partly round the pulley or band-wheel, D, and drives the roller, a^9, by passing round the pulley, E; the pulley, L, is keyed concentric with the pulley, E, and drives by a strap the pulley, G, which is keyed upon the spindle of the roller, a^6; this roller drives the roller, a^1, by a strap passing round the pulleys, F and H.

The pulley, c^1, drives by an open strap the rollers, a^7, a^3, and a^{11}, by the pulleys placed upon their spindles in a similar manner to the above.

k, k, k, k, fig. 4, are throttle-valves placed on each side of the machine at the mouths of the air-boxes, *d, d;* their use when closed is for preventing the air from passing from the air-trunks, *e, e,* into the air-boxes, *d, d,* until the paper is fairly introduced into the tubes; these valves are then opened and the air enters the air-boxes, and from these boxes it passes into the tubes travelling in the same direction as the paper.

The paper (represented by the blue line) to be dried is passed into the machine between the rollers, *a* and a^2, fig. 3, and the tapes, (represented by the red lines,) firstly closing the throttle-valves at the mouth of the air-box belonging to the tube, *b*, until the paper has passed the apertures for the air at the points, *f, f,* in tube, *b*, and when it has so passed, the throttle-valves are opened and the air is forced on both sides of the sheet in the direction the paper is travelling, taking up and carrying off the wet and moisture in the form of vapour, and discharging it at the end of the tube, *b*, at *g, g*. When the paper reaches the roller, a^1, it is passed beneath it into the tube, b^1, and the tape, *h*, is passed round the roller, a^{11}, and returns to roller, *a*. The paper in the tube, b^1, has the air thrown on both sides of the sheet, and the vapour is expelled at the end of the tube, b^1, at *i, i*. The paper is then passed into the tube, b^2, round the roller, a^4, and the tape, *j*, returns into the tube, *b*, round the roller, a^2. This process is repeated until the paper is passed through all the tubes of the machine and the paper is dry. In drying thin papers it may be found unnecessary to use all the tubes, as the paper may be found dry after it has passed through a certain number of them, when the paper may be taken off and wound upon a reel or passed through a cutting machine at pleasure.

Hand-made papers and papers that are cut into sheets before they are sized, are, after sizing, generally hung upon lines in rooms or lofts, and dried,—in summer by the natural atmosphere, and in winter by dry air warmed by steam-pipes, &c. This mode is very expensive and occupies a great deal of time, it also requires a considerable space to dry in: to obviate this I have invented cer-

tain methods of drying paper of this description by machinery, as hereinafter described.

My first plan is, by using a machine constructed as before described, but although I have dried such papers with the tapes passing round the rollers, yet I prefer using nets or other reticulate or open sheets for conducting the paper through the machine, and when the machine is used for drying paper in the sheets the throttle-valves are always open.

My second plan for drying paper in sheets is, by using a series of reels, round which the paper passes between tapes, cords, nets, or reticulate sheets to conduct it from reel to reel; air heated by steam-pipes or any other well-known means rises against the surface of the paper and dries it.

Fig. 1, Sheet 2, represents a longitudinal sectional elevation of the machinery I have used for drying paper in sheets; and fig. 2, is a transverse sectional elevation of the same.

A, figs. 1 and 2, is a pulley, which may be driven by the strap, B, from any prime mover; the pulley is keyed upon the spindle of the roller, C.

D, D^1, D^2, D^3, D^4, D^5, and D^6, fig. 1, are reels or drums; E, fig. 1, is a tightening roller, and F, F^1, and F^2, are guide rollers for conducting the tapes, cords, nets, or porous sheets through the machine.

G, G, figs. 1 and 2, are steam-pipes for warming the air, or the air may be warmed by cockles, flues, or any other well-known means used for that purpose, and which need not be particularly described.

Motion is given to the reels, D, D^1, and by the endless tapes, cords, nets, or porous sheets represented by the brown lines, *a*, *b*, fig. 1, passing partly round them and the roller, C, which roller is driven by the pulley, A, and the strap, B, worked by some prime mover.

The paper, *c*, *c*, (represented by the blue line,) to be dried, is placed between the conducting tapes, cords, nets, or porous sheets at the roller, E, and when the paper reaches the reel, D, it is held between the tapes, cords, nets, or porous sheets, which conduct it over the reel, D^1, under the reel, D^2, over D^3, under D^4, over D^5, and under D^6, when the endless tapes, cords, nets, or porous sheets separate; *a*, passing over the guide rollers, F^2, F^1, and F, and *b*, passes over and beneath the rollers, C and E, to

bring through more paper, and the dried paper is taken off the machine at the roller, c.

During the time that the paper is passing through the machine it is subjected to the warm air from the steam-pipes, G, G, and the vapour rises out of the top of the machine and is discharged into the atmosphere through openings made for that purpose in the roof of the building.

Although up to this stage I have only spoken of drying sized paper, yet I have used the machines thus described for drying water-leaf, or paper before it has been sized, and I find the paper so dried approaches more nearly in quality the character of such papers when dried in lofts.

My third method of drying papers in sheets after they are sized is by using metal cylinders heated by steam, instead of using the reels or drums just described, in my second method of drying paper in sheets.

In this case I prefer coating all or some of the cylinders with felt, cloth, wooden slips placed a short distance apart, or with any material that is not a good conductor of heat, which prevents the size drying too rapidly on the surface of the paper; but some paper of an inferior quality may be dried by coming in contact with the metallic surfaces, excepting so far as it may be separated by the endless tapes, cords, nets, or sheets, which I always use with the metallic cylinders for conducting the paper. Although the cylinders just mentioned may be driven by the tapes, cords, nets, or porous cloths, yet I prefer driving them by a train of wheel-work, in the same manner that the cylinders of the well-known drying machine is driven, and which machine is used for drying papers in long lengths, and is generally placed at the end of the paper-making machine.

My fourth method of drying paper in sheets, after they are sized, is by using a single reel or drum of large diameter; this drum is turned at a slow rate, the paper is kept to the surface of the reel by endless tapes, cords, nets, or open sheets, and warmed air is allowed to rise against the surface of the paper to dry it.

Instead of using the large reel just described, a heated metallic cylinder can be used, the paper being retained upon its surface by the endless tapes, cords, nets, or sheets; and whether the reel or the cylinder is used, the

endless tapes, cords, nets or porous sheets may be returned by guide and conducting rollers, in a similar manner to the tapes and guides of a printing machine, or as described in the tubular machine in my first method of drying papers.—In witness, &c.

ROBERT RUMNEY CRAWFORD.

Enrolled January 10, 1851.

Specification of the Patent granted to JAMES FORSTER, *of Liverpool, Merchant, for Improvements in Filtering Water and other Liquids.*—Sealed June 27, 1850.

WITH AN ENGRAVING.

To all to whom these presents shall come, &c., &c.—The invention consists,

First, of improvements in apparatus used for filtering water and other liquids; and,

Secondly, my invention consists of cleansing filters by chemical means. And in order that my invention may be most fully understood and readily carried into effect, I will proceed to describe the means pursued by me.

Description of the Drawing.

The drawing shows a section, a plan, a side elevation, and an underside view of apparatus, constructed according to my invention. *a*, is the filtering vessel, which I prefer should be composed of filter-stone, but other porous matter made into the form of a hollow vessel and suitable for filtering, according to my invention, may be employed, and I believe the spherical form to be the best for this vessel, but I do not confine myself thereto. *b*, is an external vessel or jacket, which is to be of such strength as to sustain the pressure of the water or other fluid supplied from a main, or by a force pump at *c*, and the water or other fluid is forced into the vessel, *a*, and through the outlet, *d*, and it is to be understood that the filtering and delivery of the water or liquid depends on the force or pressure of the fluid, there being no passage or pipe for admitting air into the porous vessel, *a*. In making the vessel, *a*, of filter-stone, I cause it to be

made or cut in two parts, and I cement them together, as shown, and for the outlet I use an earthenware or other junction, *d*, as shown. *e*, is a cock or tap communicating with the jacket or outer vessel; this serves the purpose of cleansing the space between the outer and inner vessel, and also for drawing unfiltered water when required.

I would remark that I am aware that filtering vessels have before been made of stone and other porous matters, and placed in cisterns or other open vessels, the water flowing therefrom by reason of the use of suitable air-pipes or passages. I do not therefore claim the same; this part of my invention consisting of the mode herein described of combining hollow filtering vessels and inclosing vessels with suitable taps or outlets, as described, so that the filtration and discharge of the water or other liquid shall be by the pressure of the fluid, as explained.

I will now describe the second part of my invention, which consists in a chemical method of cleansing or purifying the filtering material through which the water or other fluid is made to pass.

The removal of solid or insoluble impurities being the object sought to be gained by all processes of filtration, it therefore becomes necessary from time to time to have means of removing them not only from the surface of the filtering-stone, whether it be artificial or natural, but also when such have penetrated beyond its surface.

To effectuate this purpose I adopt the following means, which vary with the circumstances and with the nature of the impurities to be got rid of.

First, should the pores of the filter become stopped during the process of filtration by aluminous or clayey matter, it (the filter) is to be unfastened from its outward casing, and then immersed in a boiling solution of dilute sulphuric acid, containing a small proportion of nitrate of potassa. After remaining so immersed for a period varying from five to fifteen minutes, it is to be removed, and the alum there formed, together with the free acid, may be readily washed from the stone by passing water through it.

In this process I prefer to use a solution of the following strength, namely:—Two fluid ounces of sulphuric acid to one pint of water,* in which is dissolved a quarter of an ounce of nitrate of potash.

Second, should the filter become obstructed by lime or its carbonate, in the state of chalk, in order to remove either of these substances, I prefer to use a dilute solution of hydrochloric acid, in the manner above stated, that is to say, by the immersion of the filter, but in this case it is unnecessary to raise the dilute acid beyond the ordinary temperature. By this treatment the lime or chalk being soluble in this acid is easily removed from the interior of the filter by washing. The strength of the solution to be in the proportion of two fluid ounces of acid to one pint of water.

Third, should the porosity of the filter become obstructed by oxide or carbonate of iron, these substances may be dissolved in like manner by dilute muriatic acid in combination with a similar quantity of water, and at the ordinary temperature. The resulting chloride of iron is then easily got rid of by passing water through the filter.

Fourth, should the porosity of the filter become obstructed by an oxide of lead, in order to cleanse it of this substance, the filter is to be immersed in a hot or boiling solution of dilute nitric acid, there to remain for a short period, varying from ten to fifteen minutes, after which the resulting nitrate of lead may be cleansed from the filter by washing in water. In this instance I prefer to have the strength of the acidulated solution, in the proportion of three fluid ounces of nitric acid to one pint of water.

Fifth, when the pores of the filter become obstructed by carbonaceous or peaty matter, such are to be dissolved by the application of concentrated sulphuric acid, raised a little above the common temperature to facilitate the solubility of the carbonaceous matter. After which treatment the dissolved carbon may be removed from the filter by boiling water.

Sixth, should the filter become obstructed by the refuse or more solid impurities of oily or fatty matter, they are to be removed by a hot alkaline solution, consisting of either soda or potash, in which it is well known such substances become saponaceous, and in consequence are easily removed by hot water. With regard to the above methods of cleansing by chemical agency, I wish it to be distinctly understood that I do not confine myself thereto, as I am aware that there are other acids and

alkaline substances, which are capable of effectuating the same objects as are here named, but there are none, I believe, at present known to chemists, which may be applied so cheaply and effectually as those I have pointed out.

What I claim is,

The application of bodies which act while in solution as chemical solvents of those impurities which obstruct the action of filters.—In witness, &c.

JAMES FORSTER.

Enrolled December 27, 1850.

Specification of the Patent granted to JAMES ALEXANDER HAMILTON BELL, *of the city of New York, in the United States of America, Merchant, for Improvements in Dressing Bran, Pollard, and Sharps.*—Sealed June 6, 1850.—(Communication.)

WITH AN ENGRAVING.

To all to whom these presents shall come, &c., &c.—

Fig. 1, is a perspective view.

Fig. 2, a longitudinal or side elevation.

Fig. 3, a view of the upper end of the cylinder, bolt, and case.

Fig. 4, a perspective view of cylinder, showing part and position of the bolt and case.

Fig. 5, a view of bolt and edges of case.

Fig. 6, a view of the lower end of the cylinder.

Fig. 7, a view of the platform and conductors.

Fig. 1, the full machine in perspective, the frame of which, A, A, should be made about two and a half feet wide by four feet long inside, and about four feet high, and of timber at least four inches square. B, represents a cylindrical case of sheet-iron, supported on the inside by ribs running lengthwise, two inches square. Said case to be twenty-two inches in diameter, and thirty-two inches high, inclosed in which (and supported by and attached to the ribs upon the inside of the case) is a cylindrical bolt made of wire-cloth, B², and perforated sheet-iron, B¹, eighteen inches in diameter, and thirty-two inches high.

Also inclosed within said case, and within the bolt, is a revolving cylinder, C, sixteen inches in diameter, and twenty-nine inches long, and attached to and driven by the shaft, M. At C^2, is represented the cover or top to the case, B, through the centre of which is a hole four inches in diameter, rising through which is the shaft, M. At D, is shown the platform on which rests the case, and through the centre of which is to be a hole, D^1, similar to that in the top, C^2, through which may pass the shaft, M, also for the free admission of air, being more fully shown at fig. 7. At E, is shown a conductor, used to convey bran, &c. through the top to the inner portion of the cylinder for cleaning. At F, is shown a conductor, through which is discharged the bran, &c., after cleansing. At G, are shown conductors to convey off the flour, the upper ends of which are connected with the bottom of the bolt, or the spaces, E, or openings in the bottom, D, between the bolt and the case. At H, I, J, K, K, and L, respectively, are shown a shaft, pulley, band, pinion, spur wheel, and driving pulley, used to drive the cylinder the required velocity, the band, J, passing from the pulley, I, and around the pulley, N, attached to the lower end of the shaft, *m*, *m*, as shown at fig. 2.

Fig. 2, at A, A, represents side view of the frame, B, the case surrounding the bolt, cylinder, &c. C^2, top of case. D, platform. E, conductor to feed the machine. F, conductor for bran, &c., after cleaning. G, G, flour conductor. H, shaft. I, large pulley. J, band. K, K, pinion, and spur wheel. L, driving pulley. M, M, cylinder shaft. N, pulleys.

Fig. 3, shows the top view of the cylinder, bolt, and case with the top (C^2, fig. 1) removed. B, shows the edge of case. B^1, the edge of bolt. C, the upper end of the cylinder. D, D^1, fig. 7, an extension of ribs upon the outside of the case, to admit of bolts to fasten the case, which is made in sections, together.

Fig. 4, shows in perspective the cylinder made of wood, and parts of one half of the case and bolt. B, B, the case. B^1, B^1, B^1, the bolt. C, the cylinder. At D^2, D^2, D^2, on the cylinder is represented sections or strips of teeth projecting outward about three-fourths of an inch from the surface; the teeth may be made of brads or small cut nails, with the heads removed and driven in; or may be made by driving large tacks through strips of leather, at

intervals of one-fourth of an inch more or less, and nailing the strips of leather on the cylinder, with the points of the tacks projecting; the latter mode is the best; the sections of teeth should cover about one half of the surface of the cylinder. E², is a similar strip to those at D², constructed in the same manner, and nailed on the upper end and around the outer edge, with the teeth projecting upward; it may be from two to four inches wide. At F², F², and upon the surface of the cylinder is shown strips or wings of sheet-iron or tin fastened to the cylinder, with one edge (or both) turned at right angles with the surface of the cylinder, so as to form wings; they may be put on at regular or irregular intervals, so as to balance the cylinder; the upper wings, as at *g*, to be put on spirally, so as to cause a downward and spiral motion to the current of air between the cylinder and the bolt; but in no case must these wings project beyond the ends of the teeth.

At fig. 5, is shown sections of the bolt and case. B, B, edges of case. B¹, B¹, the upper part of the bolt made of sheet-iron thickly perforated with small holes by indentation with a sharp-pointed punch, and put on with the rough side next the cylinder, so as the more effectually to scour the bran, &c. B³, the lower portion of bolt made of fine wire cloth. At E³, is shown an opening leading into the escape-conductor, F, (figs. 1, 2, and 7). The bolt may be made in the manner described, or the entire bolt of either substance described above, or any other like substance which will cause the same results.

At fig. 6, is shown the lower end of cylinder, case, and bolt. B, case. B⁴, bolt. C, cylinder. D⁴, D⁴, D⁴, D⁴, wings, projecting downward from the end of the cylinder about one and three-fourths of an inch.

At D, fig. 7, is shown the platform. G¹, G¹, ribs for dividing the annular space between the case and bolt into sections. D⁵, a hole for the free admission of air, and through which the shaft of the cylinder is to pass. E⁴, E⁴, are the segmental spaces or openings in the bottom, D, between the bolt and case; these spaces should be a segmental mortice cut through the platform, corresponding in shape and nearly in size with the annular space through which they pass the flour (after being bolted) into the conductors, G, fig. 1; F, the conductor for the bran after cleaning.

The above-described machine, when put in the required

motion (about eight hundred revolutions per minute), will, if constructed as above, scour and separate from bran, shorts, and ship stuff, all the remaining particles of flour which may adhere after bolting. After being put in motion, the bran or shorts or ship stuffs should be fed in through the conductor, E, fig. 1, thence falling upon the top of the cylinder, is carried by the inward current of air over the end and down the sides, between the cylinder and bolt, when it is beaten or scoured, so as to remove all the remains of flour, the bran &c. continuing in its course (not being permitted to escape through the fine wire cloth) downward, until, by a reversed current of air drawn from the bottom by the wings on the lower end of the cylinder, it is forced through the conductor, F, fig. 7 and fig. 1, while the flour passes through the bolt, with the current of air drawn in from the top into the spaces between the bolt and case, thence passes downwards into the conductor, G, fig. 1, thence to the cooler of the mill, when it is again bolted and fit for use.

The perforated portion of the bolt at B[1] may be covered on the convex surface with cloth, to prevent the escape of the flour. The vertical parallel strips of iron, H, on the cylinder, C, may be made rough by punching for scouring the bran.

Having thus fully described the construction, arrangement, and operation of the several parts of the machine, I will now add that I do not claim the original invention of a cylinder, nor of a combined, punched, and reticulated cylinder, nor of a cylinder covered with strips of punched sheet-iron and strips of leather filled with tacks, nor the arrangement of gearing by which the machine is propelled.

But I do claim the combination and arrangement of the external, upright, stationary, close cylindrical case, B, with the internal, combined, punched, and reticulated upright stationary scourer and bolt, B[1], B[2], and revolving cylindrical scourer and blower, C, constructed, arranged, and operated in the manner and for the purposes herein fully set forth, by which the fine flour that usually adheres to the bran, &c., after being subjected to the first bolting operation, is now completely separated from the bran, and collected in the annular space between the cylindrical bolt and cylindrical case, from whence it descends through the segmental openings in the horizontal base upon which

the said bolt and case rest, into conducting spouts, as aforesaid, whilst the bran is blown from the interior of the bolt through a spout leading through the external case, as aforesaid, the meshes of the bolting cloth being kept open by the pressure of air produced inside the combined cylindrical scourer and bolt by the manner in which the oblique and radial and parallel wings are arranged on the revolving, scouring, and blowing cylinder, as above set forth.—In witness, &c.

JAMES ALEXANDER HAMILTON BELL.

Enrolled December 5, 1850.

Specification of the Patent granted to WILLIAM DICK, *of the City of Edinburgh, Professor of Veterinary Medicine in the Edinburgh Veterinary College, for Improvements in the Manufacture of Steel and Gas.*—Sealed August 22, 1850.

To all to whom these presents shall come, &c., &c.—These improvements consist in the making of steel and gas in the same retort at one and the same time. I employ the fireclay gas retort, now in common use. When it is heated to the usual temperature required for the production of gas, I introduce the iron intended to be cemented, preferring to act on bars of a length equal to that of the retort; and these bars are disposed horizontally on the lower part of the retort, a thin layer of coke intervening between them and the retort. The retort is then charged in the usual way as for making gas, and the usual process of gas-making continued, the retort being charged with fresh supplies of coal or other materials capable of making gas, at the usual intervals, and in the usual manner, the bars of iron remaining in the retort for a longer or shorter period, according to their size or thickness, and being turned over at intervals of two or three days, at the times when the retort is being charged with fresh supplies of coal or other materials capable of making gas, and allowed to remain in the retort till the process of cementation be completed; the process of cementation being tested in the usual way by withdrawing

one of the bars, suddenly cooling and breaking it, and the process of cementation to be continued until the disappearance of the pith in the centre indicates the completion of the process of cementation, when it will be found that steel has been produced.

I do not claim the conversion of iron into steel by the action of carburetted hydrogen gas on iron shut up along with the gas.

But what I claim is, the process of making steel and gas in the same retort or furnace at one and the same time.—In witness, &c.

WILLIAM DICK.

Enrolled February 22, 1851.

Specification of the Patent granted to SELIM RICHARD ST. CLAIR MASSIAH, *of Alderman's-walk, New Broad-street, in the City of London, for Improvements in the Manufacture of Artificial Marble and Stone, and in treating Marble and Stone.*—Sealed August 10, 1850.

To all to whom these presents shall come, &c., &c.—

Firstly, cut or shape the gypsum or sulphate of lime, or alabaster, to the required form, and place it in the drying room at the temperature of from 80 to 100 degrees of Fahrenheit.

Secondly, when thoroughly dried, immerse it in a warm solution of borax and sal-enixum, in the proportions of about one pound borax and a quarter of an ounce sal-enixum to the gallon of water; take it out, and again place it in the drying room.

Thirdly, when dry, expose it to a heat of from 250 degs. of Fahrenheit or upwards, until the watery parts are entirely driven off; take it out of the oven or stove, and, to prevent decrepitation, let it cool till the hand can be borne on it for a few seconds; then immerse it for the second time in a hot saturated solution of borax, to which add from a quarter to 1 oz. of concentrated nitric acid to each gallon. Attention must be paid to the quality of the nitric acid, by obtaining the best and most concentrated, as much of the hardness and bleaching quality depends on it. Leave it to simmer, or nearly so, until the stone is

thoroughly saturated. Take it out, and leave it to dry, when it will be found to have acquired a marble-like hardness.

Fourthly, a day or two after, heat it gently, and apply to it Canada balsam diluted in turpentine or naphtha; it may be kept warm till the spirit is driven off; or it may be taken away and suffered to be driven off by the air.

Simple coloured marbles are obtained by proceeding as already mentioned; but substituting for the solution of borax and nitric acid, a solution of borax accompanied by a dye and nitric or other acid, or a nitrate, *ex. gr.*,—for blue, a solution of borax with prepared indigo and nitrate of iron.

Compound coloured marbles are obtained by a double process; *ex. gr.*, the first process as for blue given above, when it must be suffered to dry. Then expose the stone now dyed blue to the second process of heat; suffer it to cool, as already said, to prevent decrepitation; and immerse it in a solution of borax, to which add safflower or any red dye, with nitric acid, when the blue and red separate into ranks, forming apparently natural streaks or veins, partaking of purple tints in some places, and in others preserving the red and blue veins apart and unblended. This process may be repeated with other dyes, so as to obtain three or more colours.

I do not confine myself to the use of borax and salenixum, as alum or other earths may be used.

But I claim the employment of nitric acid in the white and naturally veined marbles, and the mode of obtaining the compound colours, which may be tripled and quadrupled by multiplying the process. Old, inferior, or decrepitating marbles, I submit to the same process, and effectually strengthen or dye them.

I also claim the process when applied to these purposes.—In witness, &c.

SELIM RICHARD ST. CLAIR MASSIAH.

Enrolled February 10, 1851.

Specification of the Patent granted to Joseph Foot, *of Spital-square, in the County of Middlesex, for Improvements in Bolters*—Sealed June 27, 1850.

To all to whom these presents shall come, &c., &c.—My invention consists of the employment of silk in the manufacture of bolters. And in order that my invention may be most fully understood, and readily carried into effect, I will proceed to describe the means pursued by me. I would, however, first remark that heretofore, in constructing bolters, wool has been employed; but it is well known that there are numerous projecting ends of fibres which stand off from the surfaces of such yarn, which interfere with the holes or meshes of the open weavings, and I have found by employing silk that a great improvement is obtained, and that a larger product of flower results. In using silk I employ Italian silk by preference, and thrown in the manner of organzine, but with more twist, in order to make the same as wiry as may be, and I weave the same into a tubular form, as is well understood. And in order that the tubular fabrics of silk thus made may be larger at one end than at the other, as is generally though not invariably preferred for bolters, I cause the made work to be moistened with water by a sponge applied from time to time between the reed and the breast roll; and in winding up the fabric as it is woven, the workman adjusts the work to the requisite width as he proceeds, and which, when wound on the breast roll and dry, it will retain. These fabrics are then completed by having the head and tail leathers attached, as when using wool, and the same are to be used as heretofore, and as is well understood. I would state that, although I usually employ silk for the warp and weft, I do not confine myself thereto, as yarn of wool may be used with silk, particularly for the weft.

Having thus described the nature of my invention, and the manner of performing the same, I would have it understood that what I claim is, the employment of silk in the manufacture of bolters.—In witness, &c.

Joseph Foot.

Enrolled December 27, 1850.

Specification of the Patent granted to JAMES PALMER BUDD, *of the Ystalyfera Iron Works, Swansea, Merchant, for Improvements in the Manufacture of Coke.* —Sealed June 11, 1850.

To all to whom these presents shall come, &c., &c.—The coals of this country may be broadly divided into two great varieties; the first variety of which will with more or less facility on the application of heat, run or cake together, and which I call caking coal, and the second variety of which will not on the application of heat run together and cake, but on the contrary, each piece either remains separate and distinct, or splits into small pieces, and which second variety I will call non-caking coal.

Now, it is well known that large quantities of coal of the non-caking quality are almost valueless when reduced below a certain size, and the main object of my invention is to make this almost valueless non-caking coal available for conversion into coke. To do this I take a quantity of non-caking coal, and I take another quantity of the most caking coal I can procure, and I intimately mix these quantities of coal together in the necessary proportions, and having crushed any lumps that may be therein I subject the mixture to the ordinary process of caking bituminous coal, and the result will be a good serviceable coke, the bituminous matter of the caking coal, when liberated by heat in the coke furnace, acting during the process on the particles of the non-caking coal with which it is in contact, and cementing the whole into a homogeneous coke.

I prefer to use a pug-mill, similar to that used for mixing mortar to grind the two sorts of coal and to mix them intimately together, or rolls may be used for the purposes, either with or without grooves; or if the two varieties of coal are in a fine state of division, they may be mixed together without grinding, or the larger pieces may be separated by sieves, so that in all cases the object be obtained which is essential to my invention, of having an intimate mixture of the two opposite qualities of coal, and that the lumps or knobs shall be crushed, reduced, or taken out. At the same time I would observe that it

is not so important to crush the lumps of the caking coal as those of non-caking, as the former have a tendency to open and dissolve on the application of heat.

I do not confine myself to any description of furnace or oven, or to any mode of coking. In the process of coking, small bituminous coal is entirely applicable to my invention, but that process will be most effective that will most quickly bring the charge into a clear red heat; the ordinary modes pursued in coking small bituminous coal, as to the quantity of air to be admitted, the period at which the air is to be shut off, and for the taking out the charge, will be applicable to the coking of the mixed and reduced caking and non-caking coals.

I cannot give rules for distinct proportions of caking and non-caking coal to be used in all cases to produce the best coke, because such proportions can only be learnt from practice, as they will depend on the strength of the caking property in the binding coal, and also on the description of non-caking coal that is used, some sorts being more refractory and difficult to cement into coke than others; but what I recommend is that when it is required to make a coke of a mixture of caking and non-caking coal, that they be used at first in equal proportions, and that if the coke does not present a homogeneous appearance at the fracture, a further proportion of caking coal be added, until the non-caking coal used be found to be uniformly acted on and cemented by the bituminous matters; whilst if the coke be spongy and porous, a further proportion of non-caking coal may be added.

I would observe that every variety of non-caking coal is suitable for this process of coking, up to the most refractory descriptions of anthracitic and anthracite coal.

What I claim as my invention is,

The coking of non-caking coal by the mixture of caking coal, the two sorts being intimately mixed together, and the size reduced by crushing, grinding, or by abstraction of the lumps by sieves or other means.—In witness, &c.

JAMES PALMER BUDD.

Enrolled December 25, 1850.

Specification of the Patent granted to JOHN CHANTER, *of Lloyd's, London, and Arnold-terrace, Bromley, in the County of Middlesex, Gentleman, and* ADAM YULE, *of Dundee, Master Mariner, for Improvements in the Preparation of Materials for Coating Ships and other Vessels.*—Sealed August 1, 1849.

To all to whom these presents shall come, &c., &c.—Our invention consists in preparing and manufacturing compositions or paints for preserving and protecting ships or other vessels from marine deposits on yellow metal, copper, and single-bottom wood ships or iron. And in order that our invention may be more fully understood and readily carried into effect, we will proceed to describe the means pursued by us.

First, take from eight to ten parts of bullock's gall, to which add about thirty pounds of carbonate of iron or plumbago, in a fine powder; mix together to form a paste, to which add four gallons of sea-water or sufficient to bring the whole into the consistency of a paint.

Second mode: take thirty pounds of carbonate of iron or plumbago finely powdered to about three pounds of white arsenic, two and a-half gallons of coal-tar, naphtha, or spirit of turpentine, twelve to fourteen pounds of Stockholm pitch dissolved in the above spirit; after which mix all well together to a consistency of paint.

Third mode: for iron or zinc we use as a first coating a preparation of gutta percha or india-rubber together or separately, dissolved in coal-tar, naphtha, or other solvent to such a consistency as may be readily applied with a paint brush.

Fourth mode: take ten pounds of carbonate of iron or plumbago, finely powdered, and one pound of white arsenic mixed intimately, and add with the assistance of heat as much Russian or other tallow as will serve to incorporate them thoroughly; this is to be applied when hot and well rubbed with the powder unmixed till dry.—In witness, &c.

JOHN CHANTER.
ADAM YULE.

Enrolled August 1, 1849.

SCIENTIFIC MISCELLANEA.

EXPERIMENTAL RESEARCHES IN ELECTRICITY.

(*Continued from* p. 120.)

If a free portion of space be considered with lines of equal magnetic force passing across it, they will be straight and parallel lines. If a sphere of paramagnetic matter be placed in such a space, they will gather upon and in the sphere, being no longer parallel in their course, nor of equal intensity in every part; or if a sphere of diamagnetic matter replace the former sphere, the lines of force will open out where the sphere is, being again no longer parallel in direction nor uniform in force. When the field of magnetic force is formed between the opposite flat ends of two large magnetic poles, then these are affected, and the globes also, and there are mutual actions; a paramagnetic body, if a little elongated, points axially and tends to go to the iron walls of the field, whilst a similar diamagnetic body points equatorially, and tends to go to the middle of the field. Paramagnetic bodies repel each other, and so also do diamagnetic bodies; but one of each class being taken, they attract one another.

The convergence of the lines of force upon the opposite sides of the paramagnetic sphere, and the corresponding divergence of them on the opposite sides of the diamagnetic sphere, the author expresses by the term *conduction polarity*. This polarity he carefully distinguishes from that which depends upon the reversion of the direction of the power; the latter he considers as a property of the particles of magnetic matter; the former as dependent rather upon the action of the mass: the latter is an absolute inversion of the direction of the power, the former only a divergence or reflection of it.

Applying the idea of conduction to magnecrystallic bodies, he concluded that the magnecrystallic axis would coincide with the direction of better conduction, and thence concluded, that, if a symmetric crystal of bismuth were carefully examined in different directions, it would

be found to be less diamagnetic when its magnecrystallic axis was perpendicular to the axis of magnetic force of the field in which it was to be submitted to experiment, than when it was parallel to the magnetic axis. By means of the differential torsion balance described in the former paper, he was able to make the trial, and found the results were as anticipated. With calcareous spar and his present balance he was not able to establish any difference, but concludes that it will prove most diamagnetic when the optic axis of the crystal and the magnetic axis of the field are parallel.

Advancing to the consideration of atmospheric magnetism, the author first refers to the earth as a source of magnetic power from which emanate lines of magnetic force passing into space according to a particular but recognised distribution, and in obedience to the general laws which govern the distribution of power about a given irregular magnet. In pure space the magnetic power is considered as transmitted onwards with a certain degree of facility which is constant, but may be increased or diminished by the presence of paramagnetic or diamagnetic matter within that space. The atmosphere is a portion of such matter, and can affect the magnetic lines which pass from the earth into space, and affects them differently according to variations which continually occur in it under natural circumstances. Four-fifths nearly by volume of the air is nitrogen, which is a gas that neither under any difference of temperature or of expansion shows any alteration in its power of affecting the transference of the magnetic force; whether added to space therefore in one state or another, or when undergoing changes of a corresponding kind by natural cause, it has no influence on the magnetic force. The perfect identity in magnetic action of hot and cold nitrogen, the author proves by new and delicate experiments. Oxygen forms the remaining fifth of the atmosphere. Its great magnetic changes by expansion have been described in the Twenty-fifth Series. Those produced by difference of temperature were described in the "Philosophical Magazine" for 1847, but are now resumed with more care, and found to belong to it alone, and not to nitrogen or to carbonic acid; as its temperature is raised its paramagnetic force diminishes, being resumed as the temperature falls again. These properties it carries into

the atmosphere, so that the latter is in reality a magnetic medium ever varying, from the influence of natural circumstances, in its magnetic power. If a mass of the air be cooled it becomes more paramagnetic, if heated it becomes less paramagnetic (or diamagnetic), as compared with the air in a mean or normal condition.

The effect of the approach and retreat of the sun in his daily course is to produce such variations of changes in the temperature and expansion of the atmosphere as to influence the lines of force emanating from the earth, both in their direction and intensity; and the manner in which this influence will be developed is by means of figures and descriptions stated by the author in relation to the annual and daily variation, and the irregular perturbations of the magnetic, which he thinks are consequences of it. He then applies the result of the magnetic observations at Hobarton as a test of the probable truth of the hypothesis, and considers that it affords strong confirmation. The upper or north end of the needle there goes west until about twenty-one o'clock, whilst the dip increases: the dip still increasing until noon, the upper end returns rapidly eastward, as the sun passes by, until two o'clock, the dip then decreasing; after which the needle goes west again, following the sun. On examining the results at Toronto, corresponding effects were found to occur, when the upper or south end of the needle was considered, and therefore in accordance with the hypothesis. The examination of the observations made at Greenwich, Washington, Lake Athabasca, Fort Simpson, and St. Petersburgh, are considered as further adding confirmation. By the aid of these observations the author re-states his principles more minutely, endeavouring to indicate what difference changes in the inclination, declination, place of the sun, land, and sea, &c., will produce.

Though the sun is the cause of those changes in the atmosphere which affect the lines of force of the earth, he is not assumed as the centre of action as regards those lines; that is considered to exist somewhere in the atmosphere. It appears to be in the upper regions and not on the surface of the earth, because it increases the dip of places north and south of the tropics which have a certain amount of inclination, as at Hobarton and Toronto, both in summer and winter; but it diminishes the dip at places which are within the tropics, and with little inclination, as

St. Helena. By other kinds of observations, it appears to be in advance of the sun. All the phenomena indicate that the sun does not act directly on the needles at different places, but mediately through its effect on the atmosphere.

The author then considers the possible cause of numerous irregular variations, such as those that are shown by the photographic processes of record at Greenwich and Toronto. The varying pressure of the atmosphere, the occurrence of winds and large currents of air, of rain and snow, of the passage of those masses of warm and cold air which the meteorologist recognises in the atmosphere, of the aurora borealis, he considers may all produce changes in the lines of magnetic force, and become more or less sensible in the records of irregular variations. The author thinks it very possible that masses of air at different temperatures may be moved by the magnetic force of the earth, according to the principles of differential action made manifest in the experiments on warm and cold oxygen, in which case material as well as potential magnetic storms may exist. He concludes his paper by calling attention to the wonderful constitution of oxygen in its magnetical and electrical, as well as its chemical relations, to the offices it has to perform as part of the atmosphere.

4. "Experimental Researches in Electricity." Atmospheric Magnetism, continued. Twenty-seventh Series. By Michael Faraday, Esq., D.C.L., F.R.S., &c. Received November 19, 1850.

In order to obtain an experimental representative of the action of the atmosphere when heated above or cooled below the average temperature, the author employed a ring helix of covered copper wire, through which an electric current was passed. The helix was about one inch and a half in diameter, and having the well-known system of magnetic forces, was placed with its magnetic axis parallel to a free needle: when its position was such that a needle within the ring would point with the north end downward, then the effect in deflecting the surrounding lines of force of the earth was considered as like that of a relatively paramagnetic mass of air; and when its position was reversed, its action was representative of that of a heated or relatively diamagnetic mass of air. Bringing this helix into the vicinity of small magnetic needles, suspended either freely, or so as to show declination or

inclination, the planes of action or indifference as regards the power of deflecting the lines of force and the needle were observed. When the needle can move only in one plane, there are four quadrants, formed (in the case of the declination needle) by the intersection of the planes of the magnetic equator and meridian. When in these planes, there is no deflection at the needle; but when in the quadrants there is, and in opposite directions in the neighbouring quadrants.

As the lines of force are held in and by the earth, so these experiments were repeated with a needle in near vicinity to a magnet, and the difference of effect is pointed out: then the extent to which these results are applicable to those of the earth is considered, and their utility in guiding the inquirer.

The effect of heated air having been considered in the last paper, that of cold air is now taken up; and after considering its action in causing a contraction or drawing together of the terrestrial lines of magnetic force, according to the principles of conduction before enunciated, the author considers generally where the regions of cold which travel round the earth every twenty-four hours will be in the northern and southern hemispheres, and how they will grow up and diminish in extent and importance as the sun moves north and south during the year. After which he applies these considerations, and the results of the experiments with the ring helix, to the explication of the changes of the needle as they are given by observations at St. Petersburgh, Greenwich, Hobarton, Toronto, Cape of Good Hope, St. Helena, and Singapore. In doing this, he endeavours to explain the night action, the early morning effect, the contrary course of the needle for the same hours in different months, the difference of local time dependent on the distribution of land and water, the cumulative effect of preceding months, and the continual effect, especially in the tropical regions, of the higher temperature of the northern hemisphere above that of the south. In all these points the author sees such an agreement between the natural results and those which are suggested by the assumed physical cause of the magnetic variations, as to give him a growing confidence in the truth of the views he has put forth.—*Philosophical Magazine.*

ON ELECTRO-MAGNETISM AS A MOVING POWER.

BY PROF. CHAS. G. PAGE.*

It is well known that when a helix of suitable power is connected with the poles of a battery in action, that an iron bar within it will remain up by the induced magnetism, although the helix be put in a vertical position: and if the bar be partly drawn out of the helix by the hand, it goes back with a spring when the hand lets go its hold. This power—the action of the helix upon the metallic bar within it,—is the power used in his engine. The power, when a single coil is used, has its points of greatest and weakest force, and in this condition is objectionable. But by making the coil to consist of a series of short independent helices, which are to be brought in action successively, the metallic rod is made to pass through the coil and back again with great rapidity and an equable motion. In all the engines hitherto used, there is a loss of power at the instant of the change of current, owing to the production of a secondary current moving in the opposite direction, and to this loss is owing the fact that these engines cannot be rendered available. Professor Page had in view the obviating of this difficulty when he commenced his recent investigations, and has full success in his new invention.

The Secretary of the Navy on Tuesday sent to the Senate, in answer to their call for information, the following report from Professor Charles G. Page, being an outline only of his experiments in the application of electro-magnetism:—

Washington, August 30, 1850.

Sir,—In compliance with your request, I have the honour to report to you the progress made in my experiments, under the Act of March 3d, 1849, appropriating 20,000 dollars for "testing the capacity and usefulness of the electro-magnetic power as a mechanical agent for the purposes of locomotion and navigation, and the probable cost of using the same."

A schedule of expenditures incurred up to this date,

* From "Silliman's American Journal" for November, 1850.

amounting to 12,667·28 dollars, is herewith annexed, by which it will appear that considerably more than one-third of the appropriation remains yet unexpended. Outstanding bills remain amounting to about 1,000 dollars, most of which is charged at the Navy-yard for material, which, when deducted, will leave about one-third of the appropriation for further prosecution of the experiment.

From the brief time allowed, it will be impossible for me to do more in this report than to give an outline of the experiments which I have repeated and recorded during the past year. Their full detail and explanation will form a volume replete with interesting scientific matter, and require much time and labour.

The first principal experiments were made with a small trial engine, built expressly for the purpose, and with the utmost care in reference to mechanical accuracy. Attached to this was a dynamometer of new construction, and admirably adapted to the purpose. This was invented by my principal engineer, and measured in a most satisfactory manner the dynamic power of the engine at any given velocity—a great desideratum in estimating this new power. With this trial engine the following important questions were tested:—

1. The dynamic values of different qualities of soft iron.

2. The dynamic values of steel—hard and soft.

3. The dynamic value of cast-iron.

The statical values of all these varieties were tested by a separate apparatus constructed for the purpose, called the axial galvanometer. Twelve varieties in all were tested, and were in bars of uniform size, one foot in length, and one inch in diameter, and it was found that the statical and dynamic properties corresponded.

4. The proportions of the helices were approximately tested; though much remains unsettled yet upon this important point.

5. The advantage of keeping up the magnetism in the axial bar was most satisfactorily tested.

6. Various modes were tried of reversing the motion of the engine, and with success.

7. Various kinds of cut-off (which is the most critical and important point in the construction of the engine) were tried.

8. The operation of closed circuits and secondary cur-

-nts was tested by a number of experiments, requiring great care and accuracy.

9. The best working velocity of this engine, and its absolute power with a given battery, was fully tested.

10. The ratio of the increase of power, with an increase in the quantity of the current.

11. The values of different kinds of metal in forming the cut-off.

12. Various mechanical points of construction, supposed to have been incompatible with the exhibition of this power, were put to a practical test.

Various other minor points also were the subject of experiment, which will be communicated hereafter.

A second model, of small size and somewhat rude construction, was also made, with a view of testing a new arrangement of the axial bars.

Experiments were then commenced upon a larger scale, with a view to determine whether the same proportion of power could be obtained from large as from small engines, this being the principal question in view at the time of the grant of the appropriation.

With a view to facilitate the construction of helices of large size, a machine which had long been in contemplation was made at a considerable expense. The work was done at the Navy Yard in a creditable manner, and the machine performed its work well, turning out entire helices of copper wire, of large size, from straight bars. But before I had proceeded far, a discovery was made in reference to the helix which rendered the machine useless, for the present at least.

A number of large helices were then constructed of various sizes, and suitable bars of soft iron prepared, corresponding to the helices. Hollow and solid bars were prepared, from two inches to eight inches in diameter, and generally three feet in length. Some bars of four and five feet in length were also prepared. The bars were all worked at the Navy Yard, and at a considerable expense, as they were required to be of homogeneous metal, accurately turned and bored.

With these bars and helices a multitude of experiments were performed and recorded, and these were kept up day after day for about two months. My official duties as Examiner in the Patent office left me only the evening of each day for operation; and, under such circum-

stances, you will readily appreciate the difficulties and disadvantages under which I have laboured. My own zeal has led me beyond my strength; but I have been richly rewarded by the most flattering results.

The experiments here were not such as could be performed upon the laboratory table; but were with large masses of iron, weighing in some cases 300 pounds, and helices sometimes twice that weight.

Adhering to the same size of battery through a long series of experiments, and varying the coils and bars, I found, to my great gratification, that as I increased the dimensions of each, a corresponding increase of power was exhibited, and the consumption of material, or cost of the power, in some proportion diminished. These results were encouraging and stimulating in the highest degree, and fully justified the undertaking at once of an engine upon a much larger scale than any hitherto tried.

This engine, the framework of which was principally built at the Navy Yard, was an upright engine of two-feet stroke; and in order to have facilities for comparative trials and experiments, it was necessary that a double engine should be made, the two parts exactly corresponding. Two bars of soft iron, six inches diameter and three feet in length, were the prime movers, and these were balanced by means of connecting rods and cranks upon a fly-wheel shaft. The balance-wheel and shaft together weighed 600 pounds. When this engine was first tried, with the same battery which had before given me one-fifth of a horse power, with a smaller engine, it produced only one-third of a horse power. By careful attention to the adjustments, and particularly to the cut-off, which was a very different thing now from what it had been in smaller engines, the engine soon yielded one-horse power. Here was a gain of eighty per cent. as measured merely by the size of the battery. But it was much more; for the cost was found to be less for one-horse power than it had been before for one-fifth of a horse power in a smaller engine; how much less has not yet been ascertained.

A great variety of experiments were continued with this engine, to be hereafter detailed, each having a definite object; and, I am happy to say, each resulting advantageously; so that finally, by little daily increments, I obtained from this engine, by a trifling addition of battery, a full two-horse power.

By way of giving a practical character to the engine, it was geared to a circular saw ten inches in diameter, the turning lathe and grindstone of the workshop, all of which it worked simultaneously, as witnessed by a number of visitors, and, if I mistake not, by your predecessor in office, in company with Lieut. Maury, of the National Observatory.

After many satisfactory trials with this engine it was taken down, and all its available parts used in the construction of the single horizonal engine which I had the honour lately to exhibit before the Smithsonian Institution. This change was made for the purpose of dispensing with the dead weight of one of the driving-bars, and more particularly for introducing the important feature of keeping up the magnetism of the driving-bar. As soon as this new form was completed and tried, a gain of one-half horse power was at once realized, and by the addition of a few more feet of battery surface, the power was found to be above four-horse. Further addition of battery would still augment the power, and I see no reason why ten-horse power might not be obtained from this engine by the addition of more battery; but whether it would be economical to increase power by this means alone, and to ascertain the point, for this and every other engine, beyond which economy would cease, by increasing the battery alone, are matters to be determined by experiment.

The next most important point to be determined was the expense of this power. Much to my own surprise and gratification, the expense was found to be less than the most expensive steam-engines; although recently, in Europe, it has been decided by experimenters and men of science, and generally conceded, that it was fifty times the cost of the dearest steam-engines. It is still, however, considerably dearer than the cheaper sort of steam-engines; but this is no obstacle to its introduction, considering its immense advantages in other respects. Moreover, if thus much has been done in the very inception of this undertaking, what may we reasonably expect from its further prosecution? *

* Prof. Page stated in his remarks before the American Association, that one-horse power for twenty-four hours would cost about twenty cents. Prof. W. R. Johnson observed that his estimate was based upon

Before it can be rendered available in practice much remains to be done with the galvanic battery, to render its action regular and durable, and in other ways to establish a certainty of action, so that the engines may be managed by persons not thoroughly skilled in the subjects of electricity and magnetism.

It remains yet also to be proved whether the power will increase in proportion to the size of the engines. This principle seems to be strongly indicated by past experiments, but yet it cannot be established by calculation or process of reasoning. Experiment upon an extensive scale can alone determine this point. A part of the work preparatory to building a locomotive engine has been done; but it seems necessary to try further experiments before incurring the expense of another large engine upon the plan above mentioned. The rotary form of the engine has not yet been tested, although it possesses advantages not to be found in any form of the reciprocating engine. There are some obvious disadvantages attending its construction; but it is hoped that they will be outweighed, more especially as this form of the engine will occupy less than one-half the room required for the reciprocating form.*

It would seem very desirable that the investigation thus begun, and so far successfully conducted, should be carried at least beyond *an uncertain issue*, and that *every important point* should be settled, and particularly that of

too high a cost for the zinc, and that ten cents would be a nearer estimate. In either case, a very great advance is made upon all previous experiments.

Prof. Page also observed, that the cost of electro-magnetic power was not to be reckoned in this comparison by the mere cost of zinc, nor the cost of steam by the pounds of coal consumed. The cost of human life, the sacrifice of millions of property, and risk of many millions more, and all the contingent advantages and disadvantages were to be taken into account.

With regard to his mode of measuring the power of the engine, Prof. Page explained as follows, after drawing a diagram of the fly-wheel. The brake was loaded to 620lbs. The power required barely to keep the engine in motion under this load was 126lbs. The full power being on, the engine made eighty revolutions per minute under this load. The circumference of the wheel being about four feet, it was easy for any one to compute the horse power from these data.

* The following notice of Prof. Page's experiments is from the "Daily National Intelligencer" of September 11.

Dr. Page's method is peculiar and entirely new, and distinct from

its availability on an extensive scale. The power is peculiarly fitted for purposes of navigation, if it can be made subservient; and a trial upon a scale of 100-horse power seems to be the only mode of arriving at a definite conclusion upon this point. It is obvious that, preliminary to such an undertaking, a great many experiments will be absolutely necessary; and such only as one quite familiar

every other hitherto tried; and therein lies the source of his success. Instead of going upon beaten tracks, which, though seemingly fair, he was persuaded would not reach the desired end, he marked out an entirely new one. One great difference between his and other plans, as I understand it to be, is this: In all former electro-magnetic machines, the power is made up of a series of impulses, while in this, which he styles an *axial* machine, or engine, the power is uniform and continuous; and it is just as easy to make a reciprocating engine of twenty-four feet stroke as one of two feet, like that already constructed and recently exhibited.

I saw at the laboratory of Dr. Page, a *rotary axial engine*, which he thinks may, in many cases, supersede the reciprocating. It is really a curious machine; and looking at this, and all his wonderful results, it appears as if we had just entered upon a new era in science and art, promising revolutions in social life and business pursuits as miraculous to the people of the day as have been those effected by the steam-engine and the magnetic telegraph. * * *

In order to show that there was something like *power*, he loaded down the engine, placed the crank at half-stroke, and then a hook over the end of the crank, to which hook was attached a long rope. Three of the strongest men of the party then took hold of the rope, two of them having their feet braced. The three men could not start the engine a hair's breadth. Four of the men then took hold, and they moved the crank two inches, where it stuck fast. The power was then let on, and the engine started, and made a speed of ninety revolutions in a minute. By taking off fourteen pounds from the end of his friction-brake, the engine made 110 revolutions per minute. Professor Page stated that this was not testing the power of the engine, but it showed that what four men could but just move through two inches, the engine carried through one-fifth of a mile, and that, too, in one minute. Understand that, from the change in the position of the crank, the power of four men could go no further than the two inches.

Professor Page expects to make a trial upon a railroad soon. He has sufficient power now to make a *demonstration*, but is not satisfied with it. He would be glad to make the first trip with fifteen to twenty-horse power. It is, however, in navigation that he expects the greatest benefits from this invention, and I would like to see the project carried out of an engine and magnetic boat (not *steam*-boat) of 100-horse power. This would settle the question, and enable the world to enter upon the benefits of the discovery, or satisfy mankind that the power cannot be made available for "locomotion or navigation;" and thus arrest the further sacrifice of mind and means, in endeavours to find that which (if it cannot be secured by the present plan) does not probably exist.

with the difficulties of entering upon an entirely new field of operation can properly appreciate.*

I have the honour to be, most respectfully,

Your obedient Servant,

CHAS. G. PAGE.

Hon. Wm. A. Graham,
Secretary of the Navy.

LIST OF IRISH PATENTS.

From January 18, *to February* 8, 1851.

WILLIAM THOMAS HENLEY, of Clerkenwell, in the county of Middlesex, Philosophical Instrument Maker, for Certain improvements in telegraphic communication, and in apparatus connected therewith, parts of which improvements may be also applied to the moving of other machines and machinery.—Sealed January 18, 1851.

JOHN RANSOM SAINT JOHN, of the City of New York, in the United States of America, Engineer, for Improvements in the construction of compasses and apparatus for ascertaining and registering the velocity of ships or vessels through the water.—Sealed January 21, 1851.

WILLIAM EDWARD NEWTON, of Chancery-lane, in the county of Middlesex, Civil Engineer, for Improvements in obtaining, preparing, and applying zinc and other volatile metals, and the oxides thereof; and in the application of zinc or ores containing the same to the preparation or manufacture of certain metals or alloys of metals. —Sealed January 22, 1851.—(Communication.)

JOHN RANSOM SAINT JOHN, of the City and State of New York, America, Engineer, for Improvements in the process of, and apparatus for, manufacturing soap.—Sealed January 24, 1851.—(Communication.)

JAMES YOUNG, of Manchester, in the county of Lancaster, Manufacturing Chemist, for Improvements in the treatment of certain bituminous mineral substances, and in obtaining products therefrom.—Sealed February 1, 1851.

* In a letter to the Editors of the American Journal of Science, dated October 14, 1850, Prof. Page states, "My engine has now reached ten-horse power. The data are as follows:—Engine, two-feet stroke; fly-wheel, 13.20 feet in circumference, 102 revolutions with 1900 pounds pressure upon its periphery."

Peter Claussen, of Cranbourne-street, in the county of Middlesex, Gentleman, for Certain improvements in bleaching, in the preparation of materials for spinning and felting, and in yarns and felts, and in the machinery employed therein. — Sealed February 1, 1850. — (Partly Communication.)

John Clare, junior, of Exchange-buildings, Liverpool, Gentleman, for Improvements in the manufacture of casks.—Sealed February 3, 1851.

Benjamin Rotch, of Lowlands, in the county of Middlesex, Esquire, for A factitious saltpetre, and a mode by which factitious saltpetre may be obtained for commercial purposes.—Sealed February 4, 1851.—(Communication.)

John Corry, of Belfast, in the Kingdom of Ireland, Damask Manufacturer, for Improvements in machinery or apparatus for weaving figured fabrics, which machinery or apparatus is also applicable to other purposes for which jacquard apparatus is or may be applied.—Sealed February 5, 1851.

Zachariah Morley, of Regent's-park, in the county of Middlesex, Esquire, for Certain improvements in the means or methods of or apparatus or machinery for decomposing water and applying the products to useful purposes.—Sealed February 7, 1851.—(Communication.)

Jasper Wheeler Rogers, of Dublin, Civil Engineer, for Certain improvements in the preparation of peat, and in the manufacture of the same into fuel and charcoal.—Sealed February 7, 1851.

Edward Clarence Shepard, of Parliament-street, in the city of Westminster, Gentleman, for Certain improvements in electro-magnetic apparatus suitable for the production of motive power, of heat, and of light.—Sealed February 7, 1851.—(Communication.)

John Matthews, of Kidderminster, Foreman, for Improvements in sizing paper.—Sealed February 8, 1851.

LIST OF SCOTCH PATENTS.

From December 23, 1850, *to January* 24, 1851.

Alfred Vincent Newton, of Chancery-lane, in the county of Middlesex, Mechanical Draughtsman, for Im-

provements in cutting and dressing stone.—Sealed December 23, 1850.—(*Six months.*)—(Communication.)

ALFRED VINCENT NEWTON, of Chancery-lane, in the county of Middlesex, Mechanical Draughtsman, for Improvements in the manufacture of iron hurdles or fences, and of certain other articles, in the construction of which ironwork is or may be employed.—Sealed December 23, 1850.—(*Six months.*)—(Communication.)

THOMAS ALLAN, of Glasgow, in the county of Lanark, North Britain, Ironfounder, for Certain improvements in paving or covering roads, streets, and other surfaces of a similar nature.—Sealed December 23, 1850.—(*Six months.*)

WILLIAM HODGSON GRATRIX, of Salford, in the county of Lancaster, Engineer, for Certain improvements in the method of producing or manufacturing velvets, or other piled fabrics.—Sealed December 24, 1850.—(*Six months.*)

JAMES NASMYTH, of Patricroft, in the county of Lancaster, Engineer, and JOHN BARTON, of Manchester, in the same county, Copper Roller Manufacturer, for Certain improvements in machinery or apparatus for printing calicoes, and other surfaces, and also improvements in the manufacture of copper or other metallic rollers to be employed therein, and in the machinery or apparatus connected with such manufacture.—Sealed December 24, 1850.—(*Six months.*)

EDWARD D'ORVILLE, and JOHN PARTINGTON, of Manchester, in the county of Lancaster, Manufacturers, for Certain improvements in finishing thread or yarn.—Sealed December 31, 1850.—(*Four months.*)

THOMAS BROWN, of Muscovy-court, Tower-hill, in the city of London, for Improvements in machinery for raising and lowering weights.—Sealed December 31, 1850.—(*Six months.*)

FRANCIS EDWARD COLEGRAVE, of Brighton, in the county of Sussex, Esquire, for Improvements in the valves of steam and other engines, in causing the driving-wheels of locomotive-engines to bite the rails, and also in supplying water to steam-boilers.—Sealed December 31, 1850.—(*Six months.*)

JAMES FORSTER, of Liverpool, Merchant, for Improvements in filtering water.—Sealed December 31, 1850.—(*Six months.*)

JAMES HILL, of Stalybridge, in the county of Chester,

Cotton Spinner, for machines for preparing cotton, wool, and other fibrous substances, for spinning and doubling.—Sealed January 3, 1851.—(*Four months.*)

Henry Bessemer, of Baxter-house, Saint Pancras-road, in the county of Middlesex, Engineer, for Certain improvements in apparatus acting by centrifugal force in the manufacture of sugar, and other improvements in the treatment of saccharine matter by such apparatus.—Sealed January 6, 1851.—(*Six months.*)

Lucien Vidie, of No. 14, Rue du Grand Chantier, Paris, in the Republic of France, French Advocate, for Certain improvements in measuring the pressure of air, steam, gas, and other liquids.—Sealed January 8, 1851.—(*Four months.*)

John Coope Haddan, of Bloomsbury-square, in the county of Middlesex, Engineer, for Improvements in the manufacture of railway carriages, and of railway wheels, and also of panels for carriages, and other purposes.—Sealed January 9, 1851.—(*Six months.*)

Samuel Hall, of Basford, near Nottingham, Engineer, for Improvements in the manufacture of starch and gums, and in the furnaces and steam-boilers, with safety apparatus, to be used in such manufacture, and for other purposes.—Sealed January 10, 1851.—(*Six months.*)

John Corry, of Belfast, in the Kingdom of Ireland, Damask Manufacturer, for Improvements in machinery or apparatus for weaving figured fabrics, which machinery or apparatus is also applicable to other purposes for which jacquard apparatus is or may be employed.—Sealed January 13, 1851.—(*Six months.*)

John Ransom Saint John, of the City and State of New York, in the United States of America, Engineer, for Improvements in the process of, and apparatus for, manufacturing soap.—Sealed January 15, 1851.—(*Six months.*)—(Communication.)

John Clarkson Milns, and Samuel Pickstone, of Radcliffe-bridge, in the county of Lancaster, Manufacturer, for Certain improvements in machinery or apparatus used in spinning, doubling, and weaving cotton, flax, and other fibrous substances.—Sealed January 20, 1851.—(*Six months.*)

Joseph Gibbs, of Devonshire-street, in the county of Middlesex, Engineer, for Improvements in manufacturing paints and cements, and panels or surfaces on which

paints and cements are or may be applied, parts of which improvements are applicable to other useful purposes.——Sealed January 20, 1851.—(*Six months.*)

EDWARD CLARENCE SHEPHERD, of Parliament-street, in the city of Westminster, Gentleman, for Certain improvements in electro-magnetic apparatus, suitable for the production of motive power, of heat, and of light.—Sealed January 22, 1851.—(*Six months.*)—(Communication.)

JAMES SLATER and JOHN NUTTALL SLATER, of Dunscar, Bolton-le-Moors, in the county of Lancaster, Bleachers, for Certain improvements in machinery or apparatus for the stretching and opening textile or woven fabrics.——Sealed January 23, 1851.—(*Four months.*)

JAMES HAMILTON, of London, Engineer, for Improvements in machinery for sawing, boring, and shaping wood.—Sealed January 23, 1851.—(*Six months.*)

JULIAN BERNARD, of Green-street, Grosvenor-square, in the county of Middlesex, Gentleman, for Improvements in the manufacture or production of boots and shoes, and other articles made of leather, dressed skins, or other materials; and in the materials and machinery or apparatus to be employed therein.—Sealed January 24, 1851.—(*Six months.*)—(Communication.)

LIST OF ENGLISH PATENTS.

From January 28 *to February* 24, 1851.

JOSEPH CROSSLEY, of Halifax, for Improvements in the manufacture of carpets, rugs, and other fabrics.—Sealed January 28, 1851.—(*Six months.*)

SAMUEL MORAND, of Manchester, for Improvements in apparatus used when stretching and drying goods.—Sealed January 30, 1851.—(*Six months.*)

BENNET WOODCROFT, of Furnival's-inn, for Improvements in machinery for propelling vessels.—Sealed January 30, 1851.—(*Six months.*)

JAMES MURDOCH, of Staple-inn, in the county of Middlesex, for Certain improvements in preserving animal and vegetable substances.—Sealed January 30, 1851.—(*Six months.*)—(Communication.)

Charles Gotthelf Kind, of Paris, in the Republic of France, Engineer, and Charles Alexis de Wendel, Ironmaster, also of Paris, in the Republic of France, for Improvements in the process and instruments to be used for boring the earth, and sinking shafts of any given diameter for mining and other purposes, and in the means of lining such shafts.—Sealed January 30, 1851.—(*Six months.*)

Alfred Vincent Newton, of Chancery-lane, in the county of Middlesex, Mechanical Draughtsman, for Improvements in manufacturing looped and other woven fabrics.—Sealed January 30, 1851.—(*Six months.*)—(Communication.)

Richard Johnson, of Manchester, in the county of Lancaster, Wire Drawer, for Certain improvements in annealing articles of iron, and other materials.—Sealed January 31, 1851.—(*Six months.*)

Juan Nepomuceno Adorno, of Golden-square, in the county of Middlesex, Gentleman, for Improvements in the construction of maps and globes, and an apparatus for mounting the same.—Sealed January 31, 1851.—(*Six months.*)

Charles Marsden, of Kingsland-road, in the county of Middlesex, Engineer, for Certain improvements in boots and shoes.—Sealed January 31, 1851.—(*Six months.*)

George Bradshaw, of Bishopsgate-street Within, in the city of London, Hosier, for Improvements in fastenings for garments.—Sealed January 31, 1851.—(*Six months.*)

Jean Paul Gage, of Paris, in the Republic of France, Chemist, for Improved chemical compounds for tissue bandages, wafers, and also for surgical purposes.—Sealed January 31, 1851.—(*Six months.*)

David Davies, of Wigmore-street, Cavendish-square, in the county of Middlesex, Coachmaker, for Certain improvements in the construction of wheel carriages, and in appendages thereto.—Sealed January 31, 1851.—(*Six months.*)

John Davie Morris Stirling, of Black Grange, N.B., Esq., for Improvements in the manufacture of metallic sheets, in coating metals, in metallic compounds, and in welding.—Sealed January 31, 1851.—(*Six months.*)

Samuel Allen, Jun., of Birmingham, in the county of Warwick, Manufacturer, for Certain improvements in the manufacture of buttons.—Sealed February 1, 1851.—(*Six months.*)

Nathaniel Jones Amies, of Manchester, in the county of Lancaster, Manufacturer, for Certain improvements in the manufacture of braid, and in the machinery or apparatus connected therewith.—Sealed February 1, 1851.—(*Six months.*)

Alfred Vincent Newton, of Chancery-lane, in the county of Middlesex, Draughtsman, for Improvements in communicating intelligence by electricity.—Sealed February 3, 1851.—(Communication.)

Alexander Alliott, of Lenton Works, in the county of Nottingham, Engineer, for Improvements in cleaning, dyeing, and drying machines, and in machinery to be used in sugar, soap, metal, and colour manufacturing.—Sealed February 3, 1851.—(*Six months.*)

Benjamin Ledger Shaw, of Huddersfield, for Improvements in cleaning and preparing wool and other fibrous or textile materials, and in the manufacture of coloured yarns of wool and other fibres, and in weaving.—Sealed February 5, 1851.—(*Six months.*)

Angier March Perkins, of Francis-street, Regent-square, in the county of Middlesex, Engineer, for Improvements in railway axles and boxes.—Sealed February 5, 1851.—(*Six months.*)

Charles De Bergue, of Arthur-street West, in the city of London, Engineer, for Improvements in, and in the construction of, the permanent way of railways.—Sealed February 7, 1851.—(*Six months.*)

Frederick R. Robinson, of Boston, in the State of Massachusetts, in the United States of North America, for A new and useful sewing machine.—Sealed February 7, 1851.—(*Six months.*)

William Onions, of Southwark, in the county of Surrey, Engineer, for Improvements in the manufacture of certain parts of machinery used in spinning.—Sealed February 7, 1851.—(*Six months.*)

William Onions, of Southwark, in the county of Surrey, Engineer, for Improvements in the manufacture of steel.—Sealed February 7, 1851.—(*Six months.*)

Francois Marcelin Aristide Dumont, of Paris, in

the Republic of France, Engineer, for Improved means in electric apparatus for transmitting intelligence.—Sealed February 7, 1851.—(*Six months.*)

William Edward Newton, of Chancery-lane, in the county of Middlesex, Civil Engineer, for Improvements in apparatus for milking.—Sealed February 10, 1851.—(Communication.)

Peter Fairbairn, of Leeds, in the county of York, Machinist, and John Hetherington, of Manchester, Machinist, for Certain improvements in moulding for casting pipes, railings, gates, agricultural implements, and other metal articles; and also in preparing patterns or models for the same.—Sealed February 10, 1851.—(*Six months.*)

Richard Stuart Norris, of Warrington, in the county of Lancaster, Civil Engineer, for Certain improvements in the construction of the permanent way of railways, bridges, locks, and other erections, wholly or in part constructed of metal; also improvements in breaks for railway carriages.—Sealed February 10, 1851.—(*Six months.*)

John Stephens, of the Albynes, in the parish of Astley Abbotts, in the county of Salop, Gentleman, for Certain improvements in thrashing machinery.—Sealed January 10, 1851.—(*Six months.*)

Joseph Haythorne Reed, late of the 17th Lancers, of the Harrow-road, in the county of Middlesex, Gentleman, for Improvements in saddlery and harness.—Sealed February 10, 1851.—(*Six months.*)

John Hartcourt Brown, of Fir-cottage, Putney, Surrey, Gentleman, for Certain improvements in the construction and building of ships, boats, buoys, rafts, and other vessels and appliances for preserving life and property at sea.—Sealed February 10, 1851.—(*Six months.*)

Charles Xavier Thomas, (de Colmar,) Chevalier de la Legion d'Honneur, of Paris, in France, for An improved calculating machine, which he calls "Arithmometer."——Sealed February 10, 1851.—(*Six months.*)

William Weild, of Manchester, in the county of Lancaster, Engineer, for Improvements in machinery for turning and burnishing.—Sealed February 11, 1851.—(*Six months.*)

Benjamin Heywood, of Water-street, Manchester, in

the county of Lancaster, Coach Builder, for Certain improvements in railway and other carriages.—Sealed February 11, 1851.—(*Six months.*)

George Briand, of Nicholas-lane, in the city of London, Surveyor, and Richard Fell, of the City-road, in the county of Middlesex, Engineer, for Certain improvements in obtaining fresh and pure water from salt sea and other waters.—Sealed February 16, 1851.—(*Six months.*)

Charles Howland, of New York, in the United States of America, Engineer, for Improvements in bell telegraphs.—Sealed February 11, 1851.—(*Six months.*)—(Communication.)

Angier March Perkins, of Francis-street, Regent-square, in the county of Middlesex, Engineer, for Improvements in constructing and heating ovens.—Sealed February 11, 1851.—(*Six months.*)

James Webster, of Leicester, Engineer, for Improvements in the construction and means of applying carriage and certain other springs.—Sealed February 11, 1851.—(*Six months.*)

Edwin Ullmer, of the firm of Edwin and William Ullmer, of Fetter-lane, in the city of London, Printing Press-makers, for Certain improvements in printing presses.—Sealed February 12, 1851.—(*Six months.*)

Charles William Tupper, of Oxford-terrace, in the county of Middlesex, Gentleman, and Alphonse René le Mire de Normandy, of Dalston, in the same county, Gentleman, for Improvements in the manufacture of iron, coated with other metal, commonly called "galvanized iron."—Sealed February 12, 1851.—(*Six months.*)

Charles Cowper, of Southampton-buildings, Chancery-lane, in the county of Middlesex, for Improvements in moulds for electro-metallurgy.—Sealed February 17, 1851.—(*Six months.*)—(Communication.)

Henry François Marie de Pons, of 24, Boulevard. Poissonniere, Paris, France, Gentleman, for Improvements in constructing roads and ways and pavements of streets, and the ballast of railways.—Sealed February 17, 1851.—(*Six months.*)

Gustav Adolph Buchholz, of Norfolk-street, Strand, in the county of Middlesex, Civil Engineer, for Improvements in motive power, and in propulsion.—Sealed February 17, 1851.—(*Six months.*)

David Ferdinand Masnata, of Golden-square, Regent-street, in the county of Middlesex, Gentleman, for A new mechanical system with compressed air, adapted to obtain a new moving power.—Sealed February 18, 1851.—(*Six months.*)

Thomas Dickason Rotch, of Furnival's-inn, Gentleman, for Improvements in centrifugal apparatus for separating fluid from other matters.—Sealed February 18, 1851.—(*Six months.*)

William Beadon, junior, of Taunton, in the county of Somerset, Gentleman, for Improvements applicable to the roofing of houses, buildings, and other structures.—Sealed February 18, 1851.—(*Six months.*)

Hugh Lee Pattinson, of Scots' House, Gateshead, Manufacturing Chemist, for Improvements in the manufacture of "Pattinson's Oxichloride of Lead."—Sealed February 18, 1851.—(*Six months.*)

Henry Richardson, of Aber Hourant, Bala, North Wales, Esquire, for Certain improvements in life-boats.—Sealed February 22, 1851.—(*Six months.*)

William Stones, of Queenhithe, in the city of London, Stationer, for Improvements in the manufacture of safety paper for bankers' cheques, bills of exchange, and other like purposes.—Sealed February 24, 1851.—(*Six months.*)

Edward Lloyd, Engineer, Dee Valley, near Corwen, Merionethshire, North Wales, for Certain improvements in steam-engines, which improvements are, in part or on the whole, applicable to other motive engines.—Sealed February 24, 1851.—(*Six months.*)

Peter Wood, of the Firm of Bury and Co., Dyers, Finishers, and Calenderers, Salford, in the county of Lancaster, for Improvements in printing, staining, figuring, and ornamenting woven and textile fabrics, wood, leather, or any other material substance or composition, and in machinery and apparatus employed therein.—Sealed February 24, 1851.—(*Six months.*)

John Hinks, of Birmingham, in the county of Warwick, Manufacturer, and James Vero, of Burbage, in the county of Leicester, Manufacturer, for Certain improvements in the manufacture of hats, caps, bonnets, and other coverings for the head.—Sealed February 24, 1851.—(*Six months.*)

Gabriel Didier Fevre, of Paris, in the Republic of

France, Gentleman, for Certain improvements in apparatus for manufacturing and containing soda-water and other gaseous liquids, and also in preserving other substances from evaporation.—Sealed February 24, 1851.—(*Six months.*)

Thomas Wicksteed, of Old Ford, in the county of Middlesex, Civil Engineer, for Improvements in the manufacture of manure, and in machinery to be used therein.—Sealed February 24, 1851.—(*Six months.*)

Robert Adams, of King William-street, in the city of London, Gun-maker, for Improvements in rifles and other fire-arms.—Sealed February 24, 1851.—(*Six months.*)—(Partly communication.)

Francis Clark Monatis, of Earlston, in the county of Berwick, Builder, for An improved hydraulic syphon.—Sealed February 24, 1851.—(*Six months.*)

Isaac Lowthian Bell, of Washington Chemical Works, near Newcastle-upon-Tyne, Chemical Manufacturer, for Improvements in the manufacture of sulphuric acid.—Sealed February 24, 1851.—(*Six months.*)

Henry Dircks, of Moorgate-street, in the city of London, Engineer, for Improvements in the manufacture of gas-burners, and in apparatus for heating by gas.—Sealed February 24, 1851.—(*Six months.*)

Charles Frederick Bielefeld, of Wellington-street North, Strand, in the county of Middlesex, Papier Maché Manufacturer, for Improvements in the manufacture of sheets of papier maché, or substances in the nature thereof.—Sealed February 24, 1851.—(*Six months.*)

Samuel Cunliffe Lister, of Manningham, near Bradford, in the county of York, for Improvements in preparing and combing wool and other fibrous materials.—Sealed February 24, 1851.—(*Six months.*)

Robert Hawthorn and William Hawthorn, of the borough and county of Newcastle-upon-Tyne, Engineers and Partners, for Improvements in locomotive engines, part of which are applicable to other steam-engines.—Sealed February 24, 1851.—(*Six months.*)

Amédee François Remond, of Birmingham, in the county of Warwick, Gentleman, for Improvements in the manufacture of metallic tubes or pipes, and the machinery or apparatus connected therewith, which improvements are applicable to other like purposes.—Sealed February 24, 1851.—(*Six months.*)

THE

REPERTORY

OF

PATENT INVENTIONS.

No. 4. Vol. XVI. ENLARGED SERIES.—OCTOBER, 1850.

Specification of the Patent granted to Edward Highton, *of Clarence Villa, Regent's-park, in the County of Middlesex, Engineer, for Improvements in Electric Telegraphs, and in making Telegraphic Communications.*—Sealed February 7, 1850.

WITH AN ENGRAVING.

To all to whom these presents shall come, &c., &c.—The first part of my invention consists of improvements in arranging electric circuits for telegraphic purposes.

Two or more instruments for making signals by means of electrical currents, are placed at two or more stations in a conducting circuit. Near each of these instruments are placed two batteries, the one being equal or nearly so in electro-motive force to the other. These batteries are so placed in the circuit with regard to their poles as to work in opposite directions through the circuit.

The signals are made by connecting together in a short circuit the opposite poles of any battery, or by otherwise removing the effect of that battery from the circuit, and so causing all the instruments in the circuit to be affected by the power of the remaining batteries. This arrange-

ment will be more clearly understood by reference to the diagrams on sheet No. 2.

In order to make the arrangements more clearly understood I will commence by describing the method of working of a single instrument. Let A, fig. 1, represent the coil of a telegraphic instrument, and B, represent a magnet, so arranged as to be capable of being moved to the right or left by a current of electricity passing through the coil, A. Let C, Z, and C^1, Z^1, represent two batteries of which the electro-motive force of the one is equal to the electro-motive force of the other; then it will be found that if the two similar poles of those two batteries, be joined together, and the ends of the coil, A, be joined respectively to the other poles of those batteries, that the magnet, B, will remain stationary. For although there is in this case a complete circuit for the passage of the power from each of those batteries, yet those batteries being placed antagonistically in the circuit, the one battery tending to send a current in one direction through the circuit, while the other battery tends to send an equal current through the same circuit, but in the opposite direction; there will be no indication of any current passing, as the magnet, B, will remain stationary.

If now, however, the poles, C and Z, of battery No. 1, be united by a piece of metal, nearly the whole of the power of that battery will be expended through that short circuit, and the power of the battery No. 2, not being counteracted by the power of the battery No. 1, a current from it will pass through the long circuit in which the coil is, and thereby affect the magnet, B, throwing it once to the one side, under the well-known laws of electricity. Again, if a short circuit had been made in the battery No. 2, instead of in the battery No. 1, it is evident that a current of electricity would have passed through the coil, A, from the battery No. 1, in a direction contrary to the direction of the current from battery No. 2, and the magnet, B, would consequently have been moved in the opposite direction.

It is also obvious, if either of the wires, H, L, or M, N, instead of being continuous and forming thereby a metallic circuit, had been divided in two, and the ends thereof joined to the earth plates, E and E, as shown in fig. 2, that the results produced upon coil, A, and the magnet, B, by the foregoing arrangement would have

been the same. It is evident then that in this manner a current of electricity may, as desired, be transmitted over telegraphic wires, either positively or negatively, retaining constantly an unbroken circuit. One of the simplest modes by means of which successive currents of electricity may be transmitted with great rapidity is described in fig. 3. A, is a blade of steel or hard brass, capable of being moved to the right or left by slight pressure, and which from its elasticity will return to its original position when that pressure is removed. B, is a stud, fastening the end of that spring to the mahogany base, O. D and E, are two metallic studs with steel points, F and G. If now the similar poles of two batteries, No. 1 and No. 2, be metallically united to the stud, B, and the other poles of those two batteries be metallically united to the studs, D and E, respectively, and if the incoming and outgoing ends of a telegraphic wire be also metallically united to the studs, D and E, then by moving the spring, A, to the right or left, and bringing it in contact with either of the studs, D and E, it is evident that positive or negative currents may be transmitted along the telegraphic wire as desired, and with great rapidity. I would observe that this mechanical arrangement may be varied at pleasure, so long as the ends attained are the same.

Fig. 3, shows intermediate as well as terminal instruments connected in such a circuit, so that information may be transmitted and received from any one station to any other station in the same circuit. Where the number of stations in a circuit is great,—if it is desired to save the resistance in the circuit, of those batteries at the stations which are not at the time sending a message, those batteries may be entirely removed from the circuit, and the studs, D and E, must then be metallically united in any convenient manner, or one cell only of each battery may be left in the circuit; or the batteries themselves may be changed from intensity to quantity, that is, all the positive metals in a battery may be joined together, and all the negative metals joined together, so as to form batteries, having as it were a single cell, but with great surface, as is well known. It must be observed the above mode of transmitting electricity for telegraphic purposes renders the mechanism of the instruments extremely simple.

It will be observed that under the method described in fig. 1, the metallic continuity of the telegraphic circuit is never broken. This property will be found of great advantage in the working of telegraphs.

It is obvious from the foregoing and from the well-known laws of electricity, that it is not necessary to make a short circuit throughout the whole of the cells of the one battery, in order to cause a power to flow through the telegraphic circuit from the other, but the greater the number of cells of any battery are, the power of which is removed from the long circuit, the greater will be the force circulating in that long circuit from the corresponding battery, so that the same ultimate object may be effected by increasing or decreasing the power of any battery or batteries, or by adding to or diminishing the number of cells so as to counterbalance, as desired, the effect of the opposing battery or batteries, or by otherwise increasing or decreasing their electromotive force, all of which methods will be well understood by those conversant with the laws of electricity.

Figure No. 4, shows a plan by means of which, instead of a short circuit being made in either of the batteries, as described above, either of those batteries may be entirely thrown out of the circuit by the motion of the handle.

Let C, Z, No. 1, and C', Z', No. 2, represent two batteries; let the two similar ends of those batteries, C, C', be metallically united to the stud, B, and instead of the other ends of the batteries being united to the studs, D and E, let them be joined to the studs, G and H, and let light springs, J, K, and L, M, resting against the studs, D and E, be metallically united to G and H. N and O, are pieces of ivory fastened to the springs, J, K, and L, M. Now, if the handle, X, be thrown over to the right so as to make metallic contact with the stud, E, the spring, L, M, will at the same time be thrown away from the stud, E, and thus the battery No. 2, will be thrown out of the circuit, but the metallic continuity of the long circuit will be preserved by means of the metallic spring, A; the battery No. 1, then being in the long circuit, and not opposed by the battery No. 2, which is for the time being thrown out of the circuit, will cause a current of electricity to flow through the telegraphic circuit and act on telegraphic apparatus accordingly, and the battery

No. 2, will not then be able to waste its power by expanding it through a short circuit. In like manner if the handle, x, be thrown over to the other side, a powerful current of electricity from battery No. 2, will be transmitted along the telegraphic circuit, in a direction opposite to the former, and the battery No. 1, being for the time being thrown out of the circuit, and not having a short circuit at all, will in like manner be preserved from wasting or expending its power.

The great distinctive feature in the above is as follows: It has hitherto been customary when required to send a current of electricity along a telegraphic circuit to break, as it were, the line wire in two; and to pour in, so to speak, the electric power at that severance; whereas, by several of the above arrangements, the line wire is never, as it were, severed; but to make a signal the power of a battery is removed from the circuit, or its character is changed.

My next improvement consists in causing the absence of an electric current in a telegraphic wire to make signals, and so as to be enabled thereby to dispense with the necessity for the use of batteries, or means of obtaining currents of electricity at every station from and to which it is desired to make communication by the telegraph. And first with regard to the making of audible signals by such means.

If in a telegraphic circuit there be placed a battery so that, as long as the circuit is complete, a current of electricity may be passing from that battery through that circuit, then if such circuit be broken no current will pass. Now, if at each of the various stations in such circuit, the wire of that circuit pass in suitable coils around an electro-magnet, provided with an armature which is capable of approaching towards and receding from such electro-magnet; then, if there be attached to such armatures an arm, or pin, or detent, or suitable mechanical contrivance, such that when the current of electricity is passing through the circuit, and consequently the armature attracted to the electro-magnet, such arm or pin or detent prevents an attendant piece of wound-up mechanism from sounding an alarum, but when the armature has receded from the electro-magnet, in consequence of the absence or withdrawal of such current of electricity, such arm or pin or detent is removed from such wound-

up mechanism, then such wound-up mechanism will be free to act, and thereby to sound an alarum, or to do other pre-arranged work. Such an arrangement renders it necessary to have but one battery in a circuit, instead of a battery to every station from and to which it is desired to make communications, and this battery may be placed anywhere in the wire of that circuit; of course, any machine capable of producing a constant current of electricity suited for electro-magnetic purposes would do equally well as the battery mentioned above, and in many cases where power can readily be derived by the aid of a steam-engine or other motive power, electricity produced direct from the magnet, as from the magneto-machine for instance, might be found preferable.

Fig. 5, Sheet No. 2, will explain the above arrangement. E, E, E, are electro-magnets in a telegraphic circuit extending between the earth plates, X and Y; A, A, A, are armatures working on the centres, C, C, C, capable of approaching towards and receding from the electro-magnets, E, E, E. To each of these armatures is attached a detent arm, D, capable of falling in the way of the catch pin, K, of the wheels, W, W, W; W, W, W, are similar wheels in pieces of any ordinary wound-up mechanism, which mechanism, when free, is made capable of sounding alarums, or doing any other pre-arranged work; (this mechanism, for perspicuity's sake, is omitted in the plan). The detents, D, and catch pins, K, are so arranged that when the armatures, A, A, A, are attracted to the electro-magnets, E, E, E, the wheels, W, are by means of the detents, D, and catch pins, K, prevented from revolving, and consequently incapable of sounding their respective alarums, or doing any other pre-arranged work; but when the attractive power of the electro-magnets, E, ceases by an interruption in the circuit, then the armatures, A, receding from the electro-magnets by the springs, P, the detents, D, are withdrawn from the catch pins, K, and the wheels, W, are immediately free to revolve and to cause the alarums to sound. In this way the absence of a current of electricity in a telegraphic circuit causes an alarum to sound, or other pre-arranged work to be done, while the presence of a current prevents such action going on. Any convenient means may be resorted to for breaking and uniting the circuit at the stations. The metallic spring, S, resting against the stud pin, N, and capable of being removed therefrom by pres-

sure, and falling towards and resting upon it again when such pressure is removed, will answer very well.

Again, if, instead of electro-magnets and armatures, as described, coils and moveable magnets had been introduced into the circuit, and pointers, discs, or indicators, or other instruments had been attached to such magnets, it is evident, if the magnets were free to move under the influence of the currents passing, but a tendency given to them to resist such motion, such tendency being however less than the force of such passing current, that when the circuit was broken the magnets would assume their wonted position, and visible and audible signals might thereby be given.

Another mode of transmitting currents of electricity for telegraphic purposes may be thus described:—Suppose, for example, a set of magnets and coils to be in a telegraphic circuit, and the magnets to be made moveable and influenced by electric currents passing through such coils; and suppose indicators or other instruments to be affixed to such magnets, and when no current is passing through the circuit, these magnets to assume a certain position, say vertical; then, if a battery be introduced in the circuit, as just described, the magnets will be influenced thereby, and will assume a position, say to the right. If the circuit be broken, then the magnet will again become vertical, as above described. Now, if, instead of merely breaking the circuit at any station, the broken ends of such circuit be placed in contact with the poles of another battery whose electro-motive force is greater than that of the battery just described, then, if such second battery be so introduced into the circuit as to tend to send a current of electricity in an opposite direction to that from the first-named battery, such second battery will overcome the power of the first battery, and cause a current of electricity to flow through the telegraphic circuit in a direction contrary to that from the first-named battery, and the magnets will, according to the above supposition, be deflected to the left hand. In this way may two different signals be transmitted from a station by means of one battery only at that station, viz., one signal by merely breaking a telegraphic circuit, and a second signal by throwing into the circuit at that point the power of a battery whose electro-motive force is greater than that already in the circuit. For such purpose

I prefer the electro-motive force of such second battery to be twice that of the one first named.

Fig. 6, Sheet No. 2, will explain one mode of doing this, the mechanical arrangements of which, however, may be greatly varied.

The arrangements in this figure are the same as those described in fig. 5, except that the batteries, O, Q, R, are added with their connexions, as shown, as also the studs, T, T, T, and magnets, and coils, put in the place of electro-magnets and armatures.

Now, from what has already been described, it is evident that if any handle, H, be pressed away from the stud, N, no current will pass from the battery, B, and all the magnets will assume their general state, due to the absence of a current of electricity in the circuit. Again, if the batteries, O, Q, R, have, say twice the electro-motive force of B, and if with the connexions, as shown in the drawing, any handle, H, be pressed upon the stud pin, T, then it is evident that there will be two batteries in the circuit, one of which, viz., O, Q, R, as the case may be, has, say twice the electro-motive force of the other battery, B, and a current of electricity will therefore pass through the circuit in a direction contrary to that from the battery, B, and the magnets will consequently obey the greater influence, and assume a position accordingly, such position being the reverse of that due to the battery, B.

My next improvement consists in making telegraphic signals by means of electric currents, when such currents are produced by the inductive influence of electro-magnets or coils acted on by electricity from a voltaic battery.

Fig. 7, Sheet No. 2, will explain the mode I adopt for such purpose. E, is an electro-magnet of iron or nickel. This electro-magnet is surrounded by coils of two wires, which wires are kept perfectly insulated from each other through their whole extent. One of these wires, A, B, forms part of the long telegraphic circuit, and the ends of other wires, C, D, are so arranged that they can be put in contact with the poles of a battery. If now a current of electricity be passed through the wire, C, D, the electro-magnet, E, will become magnetic. The making of E a magnet will cause an inductive current of electricity to flow through the wire, A, B; and in like manner, when the current through C, D, ceases, E will cease to be magnetic, and this cessation of magnetism in E will cause also

an inductive current to flow through A, B, as before, but in a contrary direction. These inductive currents so produced may be used with great advantage in electric telegraphs, and they possess this advantage, that they never render it necessary to absolutely break in two the metallic continuity of the telegraphic circuit. If it is desired to prevent the electricity that passes through the long telegraphic circuit from having to force its way through the resistances of the several coils on the electro-magnets, E, E, &c., it is only necessary to cause a metallic connection to exist at all times between the ends of all such coils, except only at that particular coil during the period when it is desired to produce in such coil an electric current for passing through the circuit, and then at such period this short metallic circuit must be removed, which may be done by any of the ordinary mechanical means used for such purposes.

My next improvement consists in enabling either audible or visible signals to be produced from electric currents transmitted over one line wire. For this purpose I employ a positive current to produce audible signals, and a negative current to produce visible ones, or *vice versâ*, as desired.

Thus the advantage of being able with one line wire to sound alarums at distant points, as well as to transmit intelligence, may be attained without any necessity to remove from the circuit either of the two apparatus required for those separate purposes.

In the specification of the patent granted to Mr. Henry Highton and myself, dated January 25th, 1848, is shewn how, by means of a peranode, either of two electro-magnets might be acted on, as for instance, in the step-by-step movement telegraph, where a current of electricity in one direction was used to cause a pointer to progress from letter to letter; and a current in the opposite direction was by means of another electro-magnet used to cause such pointer to progress by one bound to zero, or the starting point. Now, if to the second electro-magnet, instead of such zero-movement, an ordinary telegraph alarum had been attached, so as to be sounded by the action of such second electro-magnet, then would there have been the means of sounding an alarum, or causing a pointer to point to letters, as desired.

In like manner, if it is desired to work a step-by-step

movement telegraph, not by a secondary battery, but by a primary one passing round an electro-magnet, then if a horse-shoe magnet and coil, or other similar contrivance be also included in the same circuit, the motion of such magnet to the one side may liberate a piece of wound-up mechanism, and so sound an alarum while its motion from its quiescent position to the other side may either be arrested by a stop, or this horse-shoe magnet may be made, according to well-known plans, to work a step-by-step movement, or to give a visible signal, either by its own position or by the position of any body connected with it; or to cause a mark to be made on suitably prepared surface, while its motion to the other side may sound an alarum.

My next improvement consists in the employment of two currents of electricity of different powers for producing two different effects in telegraphic instruments. For this purpose, for one arrangement I prefer for rendering the lesser power available, the employment of a magnet and coil, constructed upon the well-known galvanometer principles, either in the horse-shoe form or the needle; and I prefer the use of an electro-magnet and armature for making the greater power available. With this arrangement I find that I can make different effects due to two different powers of electricity available with great certainty, a thing hitherto unattainable by any proposed plans, although so very desirable for telegraphic purposes.

Figure 1, Sheet No. 3, shows one form of this arrangement, where a moveable disc or dial, 1, 2, 3, 4, is used in connexion with a stationary pointer.

The telegraphic wire proceeds around the electro-magnet, E, and is also wound around the coil, C. Attached to the armature, A, is an arm, F, resting against the stop, G; this arm has a fork end, L, M, so placed that the rod, B, which is attached to the horse-shoe magnet, N, W, R, S, has liberty of motion only to a limited extent defined by the arms of such fork. The moveable dial, 1, 2, 3, 4, which is attached by an axle to the horse-shoe magnet, can move only to a certain extent so long as the fork arms remain in the position, as shewn in the drawing. But if these fork ends be brought nearer to the centre of motion of the horse-shoe magnet, then, of course, the motion of the magnet, and with it the dial, will be greater. By sending, there-

fore, a current capable of acting on the electro-magnet, E, with sufficient force to attract the armature, A, to it, the stops or fork-ends will thereby be brought nearer to the centre of the axis of motion of the moveable magnet, and the dial will move further round to the right or left, according as a positive or negative current is transmitted.

Again, if a current of electricity not powerful enough to cause the armature, A, to be attracted be transmitted, then the dial will not move so far, being restrained in its motion by the forks, L, M. By this means the moveable dial, 1, 2, 3, 4, can be made to assume with precision any one of four different positions, and, consequently, to denote any one of four primary signals with certainty and precision; and by combining these primary signals with each other, letters, words, and sentences can be transmitted, as is well known. The description above given in order to make the action clearly understood, has been confined simply to the motion of a pendent body, but it is evident that four motions there obtained may be applied to a variety of telegraphic uses; such as the greater power causing alarums to sound, and the lesser power to work pointers; or the greater power may be made to work step-by-step movements, and the lesser power to work pendent pointers, or discs, or dials, or screens; or the lesser power may be made to produce one kind of marks on paper or other suitable substances, while the greater power causes other marks to be made as well, constituting thereby different signals; or the lesser power may make marks on chemically prepared paper, while the greater power may cause such paper to be marked according to Morse's plan.

All that is necessary is to see that the weaker battery shall not work the electro-magnet, but shall work satisfactorily the moveable magnet, and then to apply such a power of battery for working the electro-magnet as shall be sure of causing its armature to move whenever desired: and this larger battery may, if desired for the saving of expense, include the smaller one.

A very useful arrangement, in which two different powers of electricity may be rendered available for telegraphic purposes, is as follows:—At each station, in the same wire as that in which a galvanometer needle and coil or horseshoe, or bent magnet and coil, or similar arrangement is

used, let an alarum, to be set free by an electro-magnet, be inserted, and let the electro-magnets and armatures be so set and adjusted that the necessary power to work the needles will not act on the electro-magnets with sufficient force to cause them to attract their armatures, and thus to set the alarums free. If, then, at each station one of the ordinary magneto-machines capable of producing sufficient electric power to cause all the alarums to sound, be inserted in the same circuit, a separate wire for the alarums may be entirely dispensed with, without it being at all necessary to remove the coils of the alarums out of the circuit, when the needles, or pointers, or discs, or suchlike instruments, are being worked; for the needles, or pointers, or discs, can be worked as usual, but the alarums will not be sounded, because the current of electricity, used for moving the pointers, is not sufficient for the sounding of the alarums, but the moment that the handle of any magneto-machine is pulled down and contact thereby broken between its armature and the magnet, a rush of electric power takes place throughout the circuit, as is well known, causing the alarums to sound, while at the same time the current from such magneto-machine is of such short duration, that the pointers are thereby only just moved to a small distance from their position of rest, and almost immediately return to such position.

It will be observed that the two different effects here produced are due both to the relative duration of the currents as well as to their relative powers.

Again, in order to produce the greatest possible amount of electric power from the receding of an armature from a magnet, I use the following arrangement of coils: hitherto the power generated from the magneto-machine has either been by surrounding the armature only with coils of wire, or the magnet only. My improvement consists in surrounding both the magnet and the armature with coils of wire. In this way much greater electric power may be obtained from the same strength of magnet.

My next improvement consists in modes of making telegraphic signals. Hitherto signals have generally been made by the motion of pointers, pointing to, or indicating letters or characters on fixed dials, such pointers being either magnetic or attached to magnets, acted on by currents of electricity passing through adjacent coils of wire.

My improvement consists in making the dials moveable, so that the characters thereon may be removed from sight as desired.

In figure 8, Sheet No. 2, let A, B, represent a disc or dial formed of some light material, such as mica or card-board, and let it be attached to an axle moving freely on centres, and to this axle let a magnet, N, S, be attached capable of being moved to the right or left by positive and negative currents of electricity transmitted through suitable adjacent coils, as is well known. Then, if there be upon such disc or dials letters, figures, characters, or symbols, such, for instance, as the figures 1 and 3, as shewn in the drawing, and if there be two screens, G, H, so arranged on the instrument that when the dial A, B, is thrown to the right the figure 3 is hidden from sight, and when the dial is thrown to the left the figure 1 is hidden, but the figure 3 remains in sight; then, by such absence of the one character or presence of the other, signals may be made, and by such successive appearance and disappearance before a slight pause, letters, words, or sentences, may be indicated.

In like manner, if, instead of the disappearance of the figure 3 from sight, the figure 1 on the dial be brought to the stationary pointer, P, fig. 10, and, instead of the disappearance of the figure 1, the figure 3 be brought to the stationary pointer, P, signals, letters, and sentences, may thereby be denoted, the difference being, that, in all former plans where signals have been made by the motion of a body to the right or left, the pointers have been moveable and the dials stationary; whereas, in the above case the dial, or disc, is made moveable and the pointer stationary. Instead of there being a magnet and a dial also, the dial may be a magnet itself, if made of a suitable form.

For the movement of the dial, I prefer, where permanent magnets are employed, the use of coils and horse-shoe or bent magnets, as described in the specification of the patent granted to my brother and myself, and dated 25th January, 1848; but where a bar or straight magnet is used I prefer a magnet of an oval shape, the two extreme ends being pointed as shewn in fig. 9, while the two middle parts or sides, W, and E, are carefully rounded, such form of magnet being less liable to be demagnetized by atmospheric electricity. But I prefer to any of the

above the use of the inductive soft iron magnets and coils hereinafter described.

I would observe, that I am aware that Alexander described a plan whereby letters were denoted by the movement of screens; such plan, however, required a telegraphic wire for each letter to be denoted, whereas I make the successive motions of one disc, dial, or screen, to represent several letters, or figures, or sentences. Thus, the removal of the figure 1 from sight before a slight pause may represent A. Two removals in rapid succession may represent B. Three removals, C. One removal of 3 may represent M. Two removals of 3, N. Three removals of 3, O. One removal of figure 1, followed by one removal of figure 3, may represent another letter, or one removal of 3, followed by one removal of 1, may represent a different letter, and so on. The maximum number of motions that will be required to denote any one of all the twenty-six letters of the alphabet, it will be found, will not exceed four.

The same may be said of bringing the figures 1 and 3 to the stationary pointer in rapid succession before a slight pause.

I would also observe, that two moveable dials may be used, the one dial being connected with one line wire, and the other connected with a second line wire. In this case the successive motions of the dials or discs, either separately or in combination, may be used to form any desired code for a telegraphic alphabet. Figures 1, 3, 5, 6, sheet No. 1, show telegraphic instruments fitted up with soft iron magnets, and moveable dials with fixed pointers. Fig. 2, shows an instrument with a combination of a moveable dial and moveable pointer. In figs. 1, 2, 3, and 4, the dials are vertical. In fig. 5, the dials are in an inclined position, and in fig. 6, the dials are horizontal. The fig. 4, has two moveable dials, the one covering a portion of the other, as shewn.

My next improvement consists in having in step-by-step movement telegraphs, an alphabet possessing more than one of those letters or characters which are of the most frequent occurrence in communications.

It is now well known that many of the letters of the alphabet are of very much more frequent occurrence in communications than others. For instance, E and T are

more frequently used than any other, and Q and Z less frequently.

It will be evident, therefore, that if there be inserted at various intervals in the alphabet, several of those letters which are so frequently used, that it will require less time to send any communication than if there had been in such alphabetical arrangement only one of each of the letters of the ordinary alphabet.

One repetition of one or two letters at most may have been used in an arrangement of the letters of the alphabet adapted for a revolving pointer, I do not claim, therefore, with a revolving step-by-step pointer telegraph the alphabet above described, unless more than two of the letters of the alphabet be repeated therein.

My next improvement consists in means of producing motion for telegraphic purposes. My improvement admits of a great variety of forms and arrangements; I will now, however, describe that form and arrangement which, I think, will be found most advantageous. I take a thin piece of soft iron, of a semicircular or semi-oval form, as shewn in fig. 3, sheet No. 3, by A, B, C. I attach to it a supporting piece of brass, D, E, F, by means of which I attach the whole to an axle, which moves freely on its centres; I then place a permanent magnet, N, S, of which magnet N is the North Pole, and S the South Pole, very near to the piece of soft iron, A, B, C. This arrangement under the well-known laws of magnetism will be found to induce a state of southern polarity to the piece of soft iron at B, and, consequently, a northern state of polarity in each of the extremes, A and C. Of course, if the south pole of the magnet, N, S, had been placed near A, B, C, contrary effects of polarity would have been induced in A, B, C. I then insert the ends of the induced magnet, A, B, C, into the middle of two helices or coils, as shewn in figure 2; and I so connect the wire of such coils that when a current of electricity is passed through, both of them, the similar or upper ends of the helices, or coils, as at O and P, show different states of magnetic polarity. It is obvious, then, when a current is transmitted through the coils, O, Q, P, R, and the ends, O, of the coil, O, Q, is endowed with, say north magnetic polarity, while the end, P, of the coil, P, R, is at the same time endowed with southern polarity, that the induced soft iron magnet, A, B, C, both of whose ends, A and C, are under the supposed

arrangement endowed with northern polarity, will tend to pass out of the coils, O, Q, and P, R, viz., the part C to approach P, while the part A, will tend to recede from O. If the current be reversed the motion of the bar in the opposite direction will ensue. By this means motion in either direction may be given to soft iron, which is rendered inductively magnetic, and that by surrounding only the poles of such induced magnet with coils of wire.

This arrangement will possess this very desirable property, that no amount of atmospheric electricity can deprive this magnet, N, S, of its magnetic virtue, nor consequently the bar, A, B, C; for the bar, A, B, C, does not derive its state of magnetism from the action of its own particles on itself, but its magnetism is produced by its proximity to another magnet, upon which currents of electricity passing through the coils produce no effect. All the injurious effects of the demagnetization of the moveable magnets of telegraphs by thunder-storms are at once got rid of, and much greater amount of magnetism may be imparted to the moveable bar than could be were it simply a magnetized steel magnet, and the electric force transmitted through the coils is expended only on those parts of the bar on which the magnetism is concentrated, producing thereby the greatest possible amount of power, and, consequently, of rapidity of motion. The bar, A, B, C, may either be weighted so as to hang naturally in the position as shown in the figure 2, or the bar may be of a semi-elliptical form, the major axis of which passes through the point B, and then if it be suspended from the centre of the oval, in that case, as the bar moves either to the right or left, the mass of metal composing the bar, A, B, C, will recede from the magnet, N, S, so that, the moment the current ceases the magnet, N, S, will pull the bar back again to its original position. Thus, the magnet, N, S, will perform the twofold object of keeping A, B, C, magnetic, as well as of giving to it a particular position of rest when uninfluenced by electric currents through the coils. Instead of N, S, being a permanent magnet, it may be an electro-magnet, kept magnetic by a current of electricity passing round it, or it may be a helix of wire producing like effects as the magnet, N, S, or it may be a compound bar magnet.

Again, instead of the magnet, N, S, being a straight magnet, and producing similar poles in the extremes of

the bar, A, B, C, a bent magnet may be substituted, as shown in fig. 4. A contrary state of magnetic polarity would then be induced in the ends of the bar, A, B, C, and, consequently, the direction of the current through one of the coils would have to be the reverse of that which it would be if both ends of A, B, C, were in the same state of magnetic polarity, according to the well-known laws of electro-magnetism. To the bar, A, B, C, the moveable dial before described may be affixed, or discs, or pointers, or screens, or detents, or other instruments as desired, and letters or sentences may be thereby indicated, or alarums may be sounded, or currents of electricity sent into various circuits as pre-arranged. As I have before observed, the shape and form of the soft iron bar may be greatly varied, varying of course with it, the form and position of the coils under the well-known laws of electro-magnetism; or pure nickel may be substituted for the soft iron. Figs. 5, 6, 7, and 8, show varied forms of soft iron bars, and permanent magnets, where the magnets are stationary, and the soft iron bars moveable. In all these figures, P, M, represent the fixed magnets, and S, I, the moveable soft iron bars. In all these cases the fixed magnets are so arranged that the motion of the soft iron bars may, if desired, take place in a vertical, horizontal, or inclining plane, and yet rest only in a defined position, with respect to the fixed magnet when uninfluenced by electric currents. This enables a telegraph constructed on this principle to form part of a writing desk, so that the eye may be enabled the better to follow the indicators at the time the communication is being committed to writing. I would also observe, that it is necessary to prevent the soft iron bars, as above described, from moving on either side, more than the greater portion of a quadrant, otherwise the bar might take two positions of rest instead of one. I prefer doing this by so making the form of the coil as to enable the bar to move only therein to the extent desired on either side, one method of which is to allow the bar to rest against the body of the shell of the coil. In these last-named figures no coils are shown, as the position and form of the coil for moving such induced soft iron magnets will be at once known to any one in any way conversant with laws of electro-magnetism. Instead of moving these soft iron magnets by coils of wire

only, motion may be given to them by means of electro-magnets of iron or nickel. If instead of using soft iron bars steel magnets be used, then it will be found very advantageous to annex another permanent magnet, as shown with respect to soft iron bars, in order to increase the magnetic power of those moveable magnets, and to prevent their demagnetization in atmospheric storms.

My next improvement consists in the causing either of two electro-magnets, or any one of three electro-magnets, at the same station in one circuit, to work as desired, by means of electric currents transmitted through that circuit.

And first, with respect to the moving of the armatures of either of two electro-magnets, such electro-magnets being in the same circuit and at the same station.

In fig. 9, Sheet No. 3, A, B, and D, E, represent two electro-magnets, with armatures working on centres X, X, and Y, Y, so that the armatures can approach towards and recede from their respective electro-magnets, under the influence of electric currents passing round the electro-magnets in the ordinary manner; R, T, is an arm, which must not be of a magnetic substance, moved by a magnet and coil working on its centre, C; so that the end, T, can, by the motion of the magnet, be interposed between either of the armatures of the electro-magnets and their respective electro-magnets, and thus prevent the armatures from approaching to the electro-magnets. A coil of wire, capable of moving the magnet and arm, R, T, to the right or left, is placed in proximity to the magnet according to any of the well-known arrangements. The wire of this coil, as also the wire of the coils of both the electro-magnets, form part of the same telegraphic circuit. If now the armatures be so set that it will require a much more powerful current of electricity to work them than to move the magnet and arm, R, T, in the way of either of those armatures, then, by sending, first a current of electricity sufficient only to move the arm to its desired position, and after the arm has moved in the way of one of the armatures of the electro-magnets, so as to prevent its motion, if the power of the current be increased so as to be capable of causing both these armatures to approach to their electro-magnets, then one only of the armatures of the electro-magnets can move; for the other will be restrained from

motion by reason of the interposition of the ends of the arm, R, T, between the electro-magnet and the armature. In this way, by sending either a positive or negative current, and by afterwards increasing those currents, either of the electro-magnets may be made to work as desired.

Again, if it is desired to cause both electro-magnets to work, then, instead of sending a current from a voltaic battery at all, if a sudden current of electricity be sent from an ordinary magneto-machine, by removing suddenly the armature from the magnet, as is well known, and if the magnet have to travel some distance before it obstructs the progress of either of the armatures, it will be found that the current has acted on both electro-magnets, having attracted their armatures before the arm had had time to interpose itself between either.

Again, if it be desired to work either of three electro-magnets in a circuit, the following arrangement, as shown in fig. 10, will answer the purpose:—

A, B, C, is a disc of card-board, or mica, or other similar non-magnetic substance, capable of being moved to the right or left on the centre, D, by means of a magnet attached thereto, and a coil of wire to act upon the magnet. This magnet may either be a needle, diamond-shaped, horse-shoe, or any other form of magnet, provided that the coil be suited to the kind of magnet employed. M, N, O, are three electro-magnets,—their armatures, for perspicuity's sake, are not shown in the drawing. The coil of the disc, and the coils of the three electro-magnets, are all continuously in the same telegraphic circuit, *i.e.*, the wire having completed one coil proceeds to another, and so on, and placed at the same station. On the disc an orifice, P, Q, is cut, as shown; so that when the disc is at rest, the armature of the electro-magnet, N, could approach its magnet, and thereby perform any pre-arranged work by such motion.

If this orifice in the disc be cut oblong, and of greater length than the armature belonging to the electro-magnet, N, so that the disc may move a little on either side without stopping the action of the electro-magnet, N, and its armature, then if a current of electricity be transmitted through the circuit from a magneto-machine, by suddenly separating the armature from the magnet, as is well known, then will the electro-magnet, N, attract its armature

to it before the disc has had time to prevent it; for a current of electricity produced by the magneto-machine, by merely separating the armature from the magnet, is of such short duration as to be unable to interpose the disc, A, B, C, if the orifice be made much wider than the electro-magnet and armature, as shown in the drawing.

If now a current of electricity be sent along the circuit from a voltaic battery, which current is capable of removing the position of the disc to the right or left, and keeping it there, accordingly as it is sent positively or negatively, but which current is not capable of producing an attractive power in any of the electro-magnets sufficient to draw to them their armatures; then, if after such smaller current is sent, and the disc has assumed its desired position, and come firm home to its stop, the strength of the current be increased sufficiently to cause the electro-magnets to attract to them their armatures, then will that electro-magnet only work, before which the orifice, P, Q, is situated at the time. In this way any one of the electro-magnets situated in the same circuit can be made to work as desired, without the necessity of employing another wire for the purpose, or the introduction of secondary batteries.

Such motion of the armatures as desired may either sound different alarums, or one armature may sound an alarum, and another work a printing telegraph, or a step-by-step revolving pointer telegraph, or a Morse's telegraph, or conduct currents along various telegraphic wires not in the main circuit, or perform any work desired in connexion with telegraphic arrangements.

My next improvement consists in a means of causing alarums to sound in distant places by means of electric currents transmitted through telegraphic circuits.

Hitherto alarums for telegraphic purposes have generally been sounded by means of the attractive force of an electro-magnet, which attraction causes a detent to be removed from a piece of wound-up mechanism, or allows a weight to fall or spring to act, by means of which a detent is removed, or the detent is removed by the direct blow of a magnet, moved by electricity developed in adjoining coils of wire, all of which actions require the development of a considerable amount of electric power. My present improvement consists in having a pendulum or balance-wheel,

similar to watch or chronometer balance-wheels, which is kept constantly vibrating, as in the ordinary clock, time-piece, watch, or chronometer. A detent, which prevents the alarum from sounding, is placed near to such pendulum, but so that the pendulum cannot strike it, unless a third body is interposed between it and the pendulum. A coil and magnet (such as is used for giving signals will do very well) are fixed near to such vibrating pendulum in such manner that when the magnet is at rest, it is not caught or touched by the pendulum as it vibrates backwards and forwards; but when a current passes through the coil, and causes the magnet to diverge, then the pendulum strikes the body interposed by the magnet, and by its introduction the pendulum is enabled to act on the detent of the alarum, and liberate the wound-up mechanism.

Fig. 11, Sheet No. 3, will explain one form of arrangement under this invention, the mechanical details of which may be greatly varied.

Fig. 12, shows another arrangement.

In fig. 11, A, represents the body, capable of being interposed; N, S, the magnet, capable of causing such interposition; C, C, is the axle on which such magnet moves. This magnet, N, S, may be moved to the desired position either by means of a coil or electro-magnet, as is well known; B, D, is a slight spring, connecting the body to be interposed with the magnet, N, S; F, M, is the detent, working on the centre; Q, R, is the detent-wheel of any ordinary alarum apparatus. When the body, A, is so moved by the magnet, N, S, as to come in the way of the pendulum (as shown by the dotted line of the pendulum) in its ordinary vibration, it is evident from the figure that the body, A, being driven by the pendulum in the direction of the arrow, O, P, will cause the detent, F, M, to release the wheel, Q, R; and thus cause the mechanism of the alarum to be set free. As soon as the body, A, is removed from the interposition of such pendulum and detent, F, M, the spring, S, will cause the detent, F, M, again to arrest the progress of the wheel, Q, R.

In fig. 12, S, I, is a piece of soft iron, rendered magnetic by means of the magnet, N, S; and also kept in the position shown in the figure, unless acted upon by currents of electricity in the adjacent coil.

It is evident, from the figure, that when the soft iron magnet, S, I, is thrown into the position, J, K, that the pendulum, on its return from V, to T, will strike such soft iron magnet, and thereby act on the arm, F, M, and cause the alarum wheel, Q, R, to be liberated. A spring, S, acts in the same manner as in fig. 11, and causes the detent, F, M, again to arrest the progress of the wheel, Q, R, on the cessation of the current, and the consequent withdrawal of the soft iron magnet, S, I, from the position, J, K, to that of its normal position, Y, Z.

I would observe, that I make no claim to sounding an alarum by means of a vibrating pendulum, or balance-wheels, unless such pendulum or balance-wheels are kept vibrating by means of gravity or a wound-up spring.

(*To be continued.*)

Specification of the Patent granted to JOEL SPILLER, *of Battersea, in the County of Surrey, Engineer, for Improvements in Cleaning and Grinding Wheat.*—Sealed January 29, 1850.

WITH AN ENGRAVING.

To all to whom these presents shall come, &c., &c.—My invention relates,—

First, to improvements in the construction and application of machinery for screening wheat, or separating therefrom foreign matter, small grains, seeds, &c.

Secondly, to improvements in the construction and application of machinery for scouring and cleaning wheat, and removing therefrom deleterious matter.

Thirdly, my invention relates to two improved modes of introducing a continuous current of atmospheric air between the surfaces of millstones whilst grinding wheat.

In the annexed drawing, No. 1, fig. 1, is an elevation of an improved separator.

Fig. 2, is the plan.

Fig. 3, an end view.

Fig. 4, a transverse section; and

Figs. 5 and 6, two end views of the same.

In all the figures, the same letters refer to the same parts. *a*, the frame; *b*, three plain cylinders; *c*, two

cylinders, with wires twisted round them, forming screws; *d*, bearing brasses for cylinders; *e*, arms projecting from centre brasses; *f*, connecting rods; *g*, eccentric spindle; *h*, handle for altering the guage; *i*, pinions for combining and giving motion to cylinders; *k*, filling pieces of wood, carrying hair-brushes.; *l*, abutment pieces; *m*, sliding plate and screw for regulating the feed.

a, is a frame, in which are placed five cylinders; three of them are plain and marked *b*, and two have a spiral wire round them, and are marked *c*. At both ends of the five cylinders proper bearings are formed, which are fitted into and rotate in the brasses, *d*. These cylinders are all turned to the same diameter, are placed parallel to each other and equidistant, and the spaces between them, which in this case form the openings for passing or screening the wheat, are adjustable to suit different sizes of grain. This adjustment is effected by the form and motion given to the brasses, *d*, (see fig. 5,) the sides of which are parallel to each other; the ends are portions of a circle equal in diameter to the height of the cross groove formed in the end of the frame to receive the said brasses. The centre brass has a projecting collar on the inside, larger than the bearing, which is turned and well fitted into a hole bored in the end of the frame, so that this brass shall turn without moving the centre cylinder. The spindle, *g*, has an eccentric pin on its end, connected by the rod, *f*, to the arm, *e*, on the centre brass, so that by moving the handle, *h*, through an arc of 180 degrees, or a half-circle, the arm, *e*, and with it all the brasses, are changed to the position shown in fig. 6. When all the parts are in the position represented by fig. 5, the cylinders are close enough for screening grain of the smallest size; but when in the position represented by fig. 6, the cylinders have uniformly opened, and are wide enough apart for screening grain of the largest size, and hence the cylinders may, by the handle, *h*, be set to screen grain of any size, and retain and separate all foreign bodies, however little in bulk, beyond the size of the grain. This opening and closing cylinders require that the brasses should be pressed and held together by some elastic force, and this is accomplished by the pieces, *l*, and the spiral springs behind them. In the above description of the means of altering the guage by the motion of the cylinders, one

end only of the separator is mentioned; it must, however, be understood, that the two ends are similarly fitted, so that by moving the handle, *h*, both ends of the said cylinders are acted upon simultaneously and uniformly.

Fig. 4, is a cross section of the frame and cylinders; the pieces of wood, *k*, are for the purpose of filling the space and holding a row of hairs, so as to form a packing or joint against the outer cylinders, and prevent any grain passing in that direction.

In fig. 3, the dotted circles round the ends of the cylinders represent five pinions, which gear into the four below them, marked *i*, so as to cause the five cylinders to turn all in the same direction and at the same velocity. Having now described my first mode of screening, I shall reserve the description of its action until shown in combination with the complete machine, of which it forms but a part, and proceed to describe two others.

Fig. 7, is a front, and fig. 8, a side elevation of this machine. A, represents a steel plate about, No. 21, wire guage, perforated with round holes; B, a plate of the same material, perforated with oblong holes, or slits of the requisite guage, to allow of the passage of seeds, &c., but retain the wheat grains.

Fig. 9 shows the two sorts of perforations in the respective plates, full size; C is a frame, to which the plates are fixed parallel to each other, and four inches apart, open at the top and bottom, and having a clear passage through it of four inches by eighteen inches. This frame, &c. is suspended by two cross bars and the four light links, D; to the ends of the said cross bars, two light connecting rods are attached, which give to the said frame a reciprocating motion, at a speed of about 400 strokes per minute. The grain, or feed, is introduced at the upper end, and as it descends by the power of gravitation, it is thrown from the surface of one perforated plate to that of the other, with considerable force, in a direction favourable to the passage of the small seeds, dirt, &c., through the perforations; so that, while the full good grains of wheat descend between the plates, the refuse is made to pass through them, and is separately collected.

I will now proceed to describe my other mode, which produces the double effect of separating both large and small matter from the grain at the same time.

It is represented on the drawing by fig. 10, which is a front elevation, and fig. 11, a transverse section. A, is a light spindle, placed at an inclination of about one inch to the foot with the horizon; on it are fixed three sets of light arms, B, which support the hollow cylinder, C; the same arms extend and support another hollow cylinder, D. Both these cylinders are made of thin steel plates, about No. 23, wire guage, and are perforated as represented in section fig. 11, and full size at fig. 12. The inner cylinder projects at the lower end about four-and-a-half inches beyond the outer one; at the upper end they are inclosed by the end-piece, E, except that a hole, F, is left in the centre, about four inches diameter, for the introduction of the grain.

This machine, when in operation, should make about thirty revolutions per minute; the grain from the hopper first enters the inner cylinder by the hole, F, and by the rotary motion is raised on the ascending side of the cylinder to an angle of from forty-five to fifty-five degrees, as represented in section fig. 11. The perforations of the inner cylinder admit of the grain passing through them into the space between the two cylinders, but retain all matter larger than the grain, which are delivered at G, by the inclination and rotation of the machine. The outer cylinder has the same kind of perforations, but of a finer guage, which allow all the matters smaller than the grain to pass through them into the hopper, H, but retain the wheat, which passes down between the two cylinders, and is delivered, ready for scouring and cleaning, into the spout, I.

Fig. 12, represents, by full size face views and sections, my improvements in perforating and bending, or moulding, steel, or other metal plates, either with flat or curved surfaces, for the purposes before described.

My improvements in scouring and cleaning wheat are as follows:—

Fig. 13, represents two cast-iron hollow cylinders, the outer one, A, is supposed to be fixed against the framework of the machine, B; it is corrugated or fluted on the inside longitudinally, or parallel to its axis, and is inclosed by a plate at the end, C. The inner cylinder, D, is hollow, with end-plates, and is corrugated or fluted on the outside, at an inclination with its axis of one and a-half inches in twenty inches. This cylinder is hung on a spindle, and

is made to revolve in, and concentric with, the outer cylinder about seven hundred times per minute. The grain enters by the hole, F, and is carried out and between the cylinders by centrifugal force, then forward by the inclination of the flutes, and is discharged at the spout, E. The distance between the most prominent points of the fixed and revolving cylinders should be about five-eighths of an inch.

Fig. 14, is a plain cylinder, about fifteen inches diameter, by twenty inches long, on the circumference of which are riveted twelve light angle irons, forming a screw-like angle of three inches in twenty, with the axis of the cylinder.

To the seangle-irons are riveted, or otherwise securely fixed, twelve slips of steel plate, each the length of the angle-irons, and in thickness about No. 18 wire guage. These slips of steel are made to project from the outside of the cylinder about one and a-half inch, and their outer edges are notched, as represented. The cylinder just described is adapted to work into a fixed, fluted, cast-iron cylinder, like that described in fig. 13, or in a cylinder composed of my perforated steel plates, as represented in fig. 12. And, lastly, for still more effectually crushing, or otherwise disposing of clods, &c., I sometimes employ, instead of either of the revolving cylinders before described, what may be called a centrifugal crushing revolver, of which fig. 16 represents an end view, and fig. 17 a plan. A, is an outside fixed cylinder, formed of my perforated steel-plate, as represented in fig. 12, so applied as that the raised part of the plate, or perforations, is on the outside of such cylinder. On the spindle, B, are keyed two cross-arms, C, to the ends of which are jointed two curved plates, E, in length corresponding to that of the perforated part of the cylinder. These plates are so connected by the rod, D, that by a little adjustment they are perfectly balanced throughout their entire revolution. When in action the spindle and arms make about seven hundred revolutions per minute, and nearly the whole of the outer surface of the curved plates is thereby pressing from the centre to the inner circumference of the cylinder with considerable power, depending on the weight of the plates and their velocity, both of which may be regulated so as to crush the earthy matter, &c., and scour the grain without breaking it. The outer parts of these curved plates

facing the cylinder may be either fluted or covered with perforated plate. In some cases I employ four such curved plates. When this is the case, in lieu of arms on the spindle, I use two square plates with a joint at each corner, but whether two or four be used it is essential that the said curved plates should be prevented by a stop from coming nearer the inside of the cylinder than three-eighths of an inch.

Figs. 18 and 19, are elevations of a machine, showing in what manner my improvements herein before described, are combined and applied to cleaning wheat.

This machine is put in motion by a strap from the first mover passing over the pulley, A, on the end of the main horizontal spindle. B, is the scouring part, or the cast-iron fluted cylinders. A pulley, C, on the main spindle gives motion to one above, D, for working the cylinder separator, E. On the main spindle is another pulley, G, which by a strap gives motion to the pulley and shaft, H, which by two cranks and two connecting-rods, I, communicate motion to the reciprocating separator, J. On the main spindle will also be seen the fan-blower, K.

The grain to be cleaned enters the machine by the spout, L, and falls direct upon the cylinders, which are set just wide enough apart to allow of the passage of the grain. The cylinders move all in one direction, about two hundred revolutions per minute, causing the grain to pass freely between them; the spiral wire at the same time takes everything larger than the grain down the incline and through the large spaces formed at the ends of the cylinders, whence it is carried off by the spouts, M. The other spout, N, takes off a few extra large or distorted grains, which pass between a small portion of the ends of the cylinders, reduced for that purpose. The feed is regulated by the plate-screw and handle, O.

The screened grain passes down the incline, P, then through the hole, Q, into the scourer by the rotation of the vanes, R. It is then scoured round between the cylinders, and by the rotation and angular position of the flutes on the inner one is carried to the other end and delivered at the leather spout, S. It then enters and passes through the separator, J, and is delivered at U; the small seeds, dirt, &c., sifted through the perforated plates, are delivered at V.

In order to give a finish to the cleaning, a strong current of air, carrying with it all dust and light matters, is drawn through the separator, J, by the fan, K, and forced through the trunk, W, to the outside of the building.

In order to apply my double separator, represented by figs. 10 and 11, I remove the cylinder and reciprocating separators from the machine just described, and fix the said double separator where the upper one, marked E, is now placed. By this arrangement, both the separating operations precede the scouring, and in such case the spout, S, delivers the scoured grain into a simple trunk, through which the air passes to the fan, carrying off the dust, &c., and completing the cleaning.

In order to apply the revolving cylinder, fig. 14, it is only necessary to open the end of the machine, slide the fluted cylinder off the spindle, and replace it by the one in question. The centrifugal crushing-revolver, figs. 16 and 17, may be applied in the same way, and in order to apply the outside or fixed cylinder of perforated steel-plate for scouring, as shown in section, fig. 16; the present cast-iron one must be removed and the perforated one secured in the same place.

My improved modes of introducing air between the surfaces of millstones are as follows:—The annexed drawing, No. 2, shows fig. 1, a section of a pair of millstones fitted with one of my improved modes.

Fig. 2, is a plan of the runner for the same, with the disc for inclosing it removed. A, is the runner, perforated with a number of holes, about five-eighths of an inch in diameter, none of which are nearer than eight inches to the edge of the eye, or nearer than three inches to the skirt. B, is a casing, forming an air-tight chamber on the back of the runner, in the top of which are two openings, to which a pipe, C, like an inverted letter, ⅃, is fitted, the vertical part of it being concentric with the millstone-spindle; on this there are three projections, which as it revolves with the runner strike the shoe, D, and act as an ordinary damsel; this pipe is jointed at E, the junction being made tight by an external bandage; the upper part, which is driven by the lower, works in a stuffing-box in the air-chest, F, which is attached to the hopper, and communicates by the fixed pipe, G, with a blowing apparatus. A short funnel, H, is in-

serted in the eye of the runner to direct the corn, and prevent its being scattered by the revolution of the L pipe, When these stones are in action air is forced by the blowing machine through the L pipe into the chamber on the back of the runner, whence it passes through the numerous perforations to the grinding faces of the stones, distributing itself, and thus absorbing and carrying off a portion of the heat generated in the act of grinding, thereby considerably increasing the amount of work performed. Figure 3, shows a section of a pair of millstones fitted with my other improved mode. Fig. 4, is a plan of the bedstone of the same. Fig. 5, a full-sized section of the opening through which the air is forced to the faces of the stones. A, is the bedstone; B, ten oblong boxes, about nine inches long and five-eighths of an inch square, inserted in the bedstone, parallel to the master furrows, and sunk slightly below the grinding surfaces; the ends of these are two inches and a half from the skirt. These boxes, which I shall call air lips, have in one side a thin parallel slit, one-twelfth of an inch wide and running their whole length; the dotted lines at C represent holes which are bored through the bedstone, and form communications between the air lips and the annular chamber, D; attached air-tight to the under side of the bedstone, the elbow-pipe, E, communicates with the blowing apparatus.

When these stones are in action a current of air is forced by the blowing machine into the annular chamber, D, thence through the holes, C, in the bedstone and air lips to the grinding surfaces. In this arrangement the position of the air lips is such that the air is delivered in a direction at right angles with the master furrows, so that the air which is forced in, instead of unduly urging the matter in process of grinding to the skirt of the stones, forces it against the inclined surfaces of the furrows and is supplied coolest where there is the greatest attrition.

Fig. 6, is a section of a pair of millstones, showing my mode of introducing a current of cold water under the bedstone. A, is a cast-iron dish, caulked water-tight to the bedstone; B, is the flow-pipe, which brings in the cold water from a tank or pump; C, is the exit pipe, for carrying off the water warmed by contact with the bedstone. When these stones are in operation a current of water is passed through the dish, A, by which so much

heat is absorbed and carried off, as to enable the stones to perform more work in a given time.

I claim, first, the peculiar construction of a separator composed of a series of equidistant cylinders, which revolve on bearings so arranged as to open or close the spaces between them, as before described.

I do not confine myself, however, to the number or proportions of the cylinders, or the kind of motion given them, but I also claim the general employment of slits bounded by adjustable moving cylinders or edges for the purpose of screening grain.

Secondly, the application of the peculiar perforated metal plates, shown at fig. 12, to the purposes before described.

Thirdly, the mode of employing reciprocating upright sieves, for the purpose before described.

Fourthly, the employment of surfaces expanding by centrifugal force in a cylinder to crush clods and scour grain, as before described.

Fifthly, the mode of introducing air between the surfaces of millstones through the runner when in action, as before described.

Sixthly, the mode of introducing air between the surfaces of millstones through the bedstone, and the peculiar form and position of the orifices, or air lips, as before described.

Seventhly, causing the circulation of cold water under the bedstones of mills, in order to absorb and carry off heat from them when grinding.—In witness whereof, &c.

JOEL SPILLER.

Enrolled July 29, 1850.

Specification of the Patent granted to EWALD REIPE, *of Finsbury-square, in the County of Middlesex, Merchant, for Certain Improvements in the Manufacture of Steel.*—Sealed January 29, 1850.—(Communication and Invention.)

WITH AN ENGRAVING.

To all to whom these presents shall come, &c., &c.—These improvements consist,—

Firstly, in a peculiar manner of working in the puddling furnace.

Secondly, in converting pig-iron, or alloys of pig-iron, and wrought-iron, into steel, with the co-operation of clay in the furnace.

Thirdly, in or by the co-operation of atmospheric air.

Firstly, I employ the puddling furnace in the same way as for making wrought-iron. I introduce a charge of about 280lbs. of pig-iron, and raise the temperature to redness. As soon as the metal begins to fuse and trickle down in a fluid state, the damper is to be partially closed, in order to temper the heat. From twelve to sixteen shovelfuls of iron-cinder, discharged from the rolls or squeezing machine, are added, and the whole is to be uniformly smelted down. The mass is then puddled, with the addition of a little black oxide of manganese, common salt, and dry clay, previously ground together.

After this mixture has acted for some minutes, the damper is to be fully opened, when about 40lbs. of pig-iron are to be put into the furnace, near the fire-bridge, upon elevated beds of cinder prepared for that purpose. When this pig-iron begins to trickle down, and the mass on the bottom of the furnace begins to boil and throw out from the surface the well-known blue jets of flame, the said pig-iron is raked into the boiling mass, and the whole is then well mixed together. The mass soon swells up, and small grains begin to form in it, and break through the melted cinder on the surface. As soon as these grains appear, the damper is to be three quarters shut, and the process closely inspected, while the mass is being puddled to and fro beneath the covering layer of cinder. During the whole of this process, the heat should not be raised above cherry redness, or the welding heat of shear steel. The blue jets of flame gradually disappear, while the formation of grains continues, which grains very soon begin to fuse together; so that the mass becomes waxy, and has the above-mentioned cherry redness.

If these precautions are not observed, the mass would pass more or less into iron, and no uniform steel product could be obtained.

As soon as the mass is finished so far, the fire is stirred, to keep the necessary heat for the succeeding operation; the damper is to be entirely shut, and part of the mass is collected into a ball, the remainder always being kept

covered with cinder-slacks. This ball is brought under the hammer, and then worked into bars. The same process is continued until the whole is worked into bars.

When I use pig-iron made from sparry iron ore, or mixtures of it with other pig-iron, I add only about 20lbs. of the former pig-iron, at the later period of the process, instead of about 40lbs.

When I employ refined Welsh pig-iron of that description, I throw ten pounds of best plastic clay, in a dry, granulated state before the beginning of the process, on the bottom of the furnace.

I add, at the later period of the process, about 40lbs. of the pig-iron, as before described, but strew over it clay in the same proportion as just mentioned.

I do not claim the commencement of the above-described process for making steel in the puddling furnace; but what I claim is, the regulating the heat in the finishing process, and excluding the atmospheric air from the mass, in the manner as described; and, also, the use or addition of iron to the mass towards the later part of the process.

Secondly, for the execution of this part of the invention, I cast pig-iron, or alloys of pig-iron, and wrought-iron, into thin bars, from about a quarter to three-fourths of an inch in thickness, as the drawings, fig. 5, *a*, and fig. 6, *b*, show. They are provided with notches, for the easier breaking them afterwards.

I employ, as the most convenient, an alloy of 75 parts of pig-iron and 25 parts of wrought-iron.

These bars are carefully enveloped into kneadable damp clay, of the best plastic quality, and are then put with great care into a furnace, as shown in drawing, fig. 1, to fig. 4.

When the furnace is filled and prepared, the fire is lighted, and slowly increased to a red heat, which must not be exceeded, and is continued, according to the size of the bars, from twenty-four hours to three days, and even longer, until samples drawn show the required conversion into steel. The furnace is then cooled, the bars are taken out, the cinder-slacks are knocked off, and the bars worked or tilted in the usual way into bars of the requisite size.

Fig. 1, is a longitudinal section of the furnace, in the line, A, B, fig. 2.

Fig. 2, the top view, with the interior of the furnace, in the section of the line, E, F, fig. 1.

Fig. 3, the top view of the furnace.

Fig. 4, the cross section, in the line, C, D, fig. 2, of double size, to show the arrangements of the bars in the furnace.

Fig. 5, view and cross section of the transverse bars in the furnace.

Fig. 6, view and cross section of the bars lengthwise in the furnace.

a, are the openings resulting from the position of the bars, *a* and *b*, lying cross and lengthwise in the furnace, as fig. 4 shows, and through which the draft and the flames of the furnace, *g*, pass, in order to diffuse the heat equally over the whole.

h, is the flue leading to the chimney; *d*, is the door through which the bars are put into the furnace, and which is to be bricked up by fire-proof bricks as soon as the bars are put in: but a small opening, which is to be shut during the operation, and which can be opened at convenience, is left open in the brick-work for drawing samples; *e*, are cast-iron plates, for binding the brick-work of the furnace together, and which are connected firmly by the wrought-iron bars, *f*.

I do not confine myself to the particular form of the furnace, or to the proportions in the alloys employed; but what I claim is, the converting of pig iron, or alloys of pig iron, and wrought iron, into steel, by exposing them to the action of clay at a proper temperature.

Thirdly, for the execution of this part of the invention, I cast pig iron, or alloys of pig iron, and wrought iron, in the same way into bars, as described in the second part of the invention; and then put them into a cylinder of fire-proof stones or other materials, in such a manner as to allow a stream of atmospheric air to pass through and to touch freely all the bars.

Both end-openings of the cylinder are then to be bricked up by fire-proof materials.

A small opening must remain in one of them, in the manner as described in the second part of the invention for drawing samples.

In the brick-work at one end of the cylinder is introduced a bent pipe, *k*, which leads downwards, as shown in fig. 7 and fig. 8.

At the other end of the cylinder, another bent pipe, *l*, is introduced, which leads upwards, as the same drawing shows. The latter bent pipe contains a slide valve, for regulating the draft. The fire is then slowly increased to redness, and then the slide in the pipe, *l*, is opened, by which a stream of atmospheric air is carried over the bars in the cylinder. This heat is continued until samples drawn show the bars to be converted into steel. The atmospheric air produces hammer-slack on the surface of the bars, which adheres very close to them, and acts much more decarbonizing than the hitherto known method of annealing with oxydizing substances, as oxyde of iron, manganese, &c.

When the samples drawn show the process to be finished, the furnace is cooled, the bars taken out, the slack knocked off, and formed in the usual way into bars of the requisite size.

I do not confine myself to the particular construction of furnace, nor to the annealing by oxydating substances; but what I claim is, the particular way of annealing, by means of atmospheric air, which is carried over bars of cast-iron, or alloys of pig iron, and wrought iron, at a red heat.—In witness, &c.

EWALD RIEPE.

Enrolled July 29, 1850.

Specification of the Patent granted to JAMES WEBSTER, *of Leicester, Engineer, for Improvements in the Production of Gas for the Purposes of Light.*—Sealed February 12, 1850.

WITH AN ENGRAVING.

To all to whom these presents shall come, &c., &c.,—My invention consists,—

First, of improvements in the manufacture of coal gas; and, secondly, my invention consists of improvements in the manufacture of gas from resin. And in order that my invention may be most fully understood, and readily carried into effect, I will proceed to describe the means pursued by me.

Description of the Drawings.

Fig. 1 is a transverse section of three retorts, arranged and combined with other apparatus, according to the first part of my invention.

Fig. 2 is a longitudinal section of the same; *a, a,* are two retorts, which are from time to time to be charged with coal, as in the ordinary manner of making coal gas in retorts; near the back end of each of these retorts there is a partition of sheet metal, which is perforated with numerous holes near its outer circumference, and the space, *c*, at the end of each retort, is filled with pieces of iron and black lead in powder; *d*, is a boiler, or closed vessel, containing water, at the upper part of the stack of retorts; *e*, is a safety-valve; *f*, is a pipe for filling the boiler, when the water is supplied; the pressure at which steam is generated is only slightly above the atmosphere; *g, g,* are pipes leading from the boiler to the back end of the retorts, so that the steam will pass amongst the heated iron and black lead before reaching the coal; the effect will be, that the retorts will become quickly coated with black lead, and the use of steam will not injure the interior surfaces of the retorts; and the object of using steam is to aid in carrying off the gas as quickly as it is evolved, and the gas from the two retorts, *a, a,* will pass into the small empty retort, *h*, by which some products which might be condensed will be insured, being converted into gas, which will pass off at the pipe, *i*, and thence through the tubes or pipes, and leave to the gas holder any condensed matters depositing in the vessels, *j, k*. The peculiarities of this part of the invention consist of the mode of applying steam, black lead, and the additional retort through which the products from the charged retorts pass.

I will now describe the second part of my invention, which is shown at figs. 3, 4, and 5, which show the two longitudinal and one transverse section. This apparatus is very similar to what has before been employed in the manufacture of gas from resin, there being three retorts, two of which, *a, a,* are regularly supplied with melted resin from the vessel, *b*, and steam is similarly supplied, from the vessel, *c*, to what has been above described in respect to making gas from coal; but in place of the steam passing in at the ends of the charged retorts it passes into the additional retort, *e*, which is charged at its

two ends with broken pieces of iron, and between them there is a quantity of black-lead powder mixed with broken pieces of iron; and the steam being passed through this retort and the heated matters, then it passes into the retorts, *a*, *a*, where gas is evolved, and it is the using of black lead and causing steam to pass amongst the same which constitutes the novelty of this part of my invention.

Having thus described the nature of my invention, and the manner of performing the same, I would have it understood that I do not confine myself to the precise details, so long as the peculiar character of either part of my invention be retained.

But what I claim is,

First, the improvements in the manufacture of coal gas, herein described; and,

Secondly, I claim the improvements herein described for manufacturing gas from resin.—In witness, &c.

JAMES WEBSTER.

Enrolled August 12, 1850.

Specification of the Patent granted to WILLIAM MAYO, *of the firm of Mayo and Warmington, Silver-street, Wood-street, Cheapside, in the City of London, Manufacturers of Mineral Ærated Waters, for Improvements in Connecting Tubes and Pipes and other Surfaces of Glass and Earthenware, and in Connecting other Matters with Glass and Earthenware.*—Sealed February 21, 1850.

Description of the Drawings.

To all to whom these presents shall come, &c., &c.—My invention consists of forming metal connexions or joints on glass or earthenware tubes and pipes, and in connecting such description of pipes and tubes, and other orifices of glass and earthenware, with other matters, by casting metal thereon. And in order that my invention may be most fully understood and readily carried into effect, I will proceed to describe the means pursued by me. The form of metal joint which I prefer, is, to have metal flanches cast on the ends of the glass and earthenware pipes or tubes, and then to connect the flanched

ends by means of screw-couplings, but the forms of the joints may be varied, so long as the same are produced by casting metal on to glass and earthenware tubes or pipes; but for convenience of connecting and disconnecting such pipes or tubes, I prefer, as before stated, to employ joints formed by flanches, and the means I resort to are as follows:—

Fig. 1, shows in section the end of a glass or earthenware tube.

Fig. 2, is an outside view of the same, having a metal shoulder cast thereon; and

Fig. 3, shows two ends of glass or of earthenware tubes or pipes joined by a screw-coupling, the screw-coupling itself being similar to what has before been employed for connecting the ends of pipes and tubes made of other materials.

Fig. 4, shows a plan.

Fig. 5, a side view of metal moulds, such as I employ for casting metal on to tubes or pipes of glass or earthenware, for the purpose of forming means of connecting them.

Fig. 6, shows an internal view of such moulds, with parts in section, arranged with a tube or pipe therein ready for having a casting of metal made thereon, and it will be found that when a metal connexion or casting is made thereon it will adhere, and be well and securely fixed, and will retain fluids in such pipes or tubes, notwithstanding the fluids therein are subjected to considerable pressure. *a*, is a portion of a tube or pipe of glass or earthenware. *b*, is the metal cast thereon. *c*, *c*, are the two parts of the mould, the interior of which is to be of such construction as to produce the form and character of connexion desired. The mould shown in the drawing is for producing cast-metal flanches on such descriptions of tubes and pipes, but it will be evident that the form and character of the metal joint may be greatly varied, requiring only variations in the interior construction and character of the moulds used for producing the metal casting on the glass or earthenware tubes or pipes. *d*, is a collar which retains the tube or pipe in a vertical position, and also closes the upper part of the mould. *e*, is a conical-plug forming the bottom of the mould, such screw-plug being screwed into the bottom plate, *f*, of

the mould, as shown, and its position may be readily adjusted. I believe pure metal tin is the best metal for making such metal connexions, and I pour such metal when melted at the "get" or opening, *g*, so that the metal will fill, and rise up from the lower part of the mould, driving the air before it. The glass or earthenware tube is warmed before putting it into the mould. By these means will a metal casting be made of the description shown and described on the end of a tube or pipe of glass or earthenware. It will be evident that such descriptions of castings being thus made on tubes or pipes of glass, they may readily be connected one to another by screw-couplings, such as is shown in the drawing, or they may by similar means be connected to surfaces of other matters, such as metal pipes or tubes. In connecting two parts together as by a screw-coupling, I prefer to apply at the joint formed (by the coming together of the two ends) a small quantity of bees' wax. By using moulds according to the form of casting desired to be made, the tubular necks, or other tubular parts of glass, or of earthenware bottles or other vessels, may have castings made thereon, suitable for connexions for fixing tubes or pipes thereto, or covers thereon; and, in like manner, may other surfaces of glass and earthenware be connected with other matters, by casting metal thereon. I would, however, remark, that I do not claim, generally, the casting of metal on to earthenware vessels; for I am aware that metal cocks, for drawing off ærated liquids, have long been made and fixed, by casting them on to earthenware bottles. My present invention is, for obtaining means of connecting tubes or pipes, or other surfaces of glass and earthenware, to each other, and to pipes or tubes and other surfaces of other matter.

Having thus described the nature of my invention, and the manner in which the same is to be performed, I would state that I do not confine myself to the details herein shown and described, so long as suitable castings of metal are made on pipes or tubes of glass or earthenware.

But what I claim is,

The forming of connexions or joints on glass and earthenware tubes and pipes, and connecting such tubes and pipes, and other surfaces of glass or earthenware, with other matters, by making castings of metal on glass and

earthenware tubes and pipes, and on other surfaces of glass and earthenware.—In witness, &c.

WILLIAM MAYO.

Enrolled August 21, 1850.

Specification of the Patent granted to GEORGE WILLIAM LENOX, *of Billiter-square, in the City of London, Chain Cable Manufacturer, and* WILLIAM ROBERTS, *Foreman to Messrs. Brown, Lenox, and Company, of Millwall, for Improvements in working Windlass and other Barrels.*—Sealed February 28, 1850.

WITH AN ENGRAVING.

To all to whom these presents shall come, &c., &c.—Our invention consists,

First, of employing flexible metal bands, embracing windlass and other barrels, in such manner that by such bands being caused alternately to contract so as to embrace such barrels, and then expand so as to be out of contact therewith, the barrels are caused to be worked; and this part of our invention also consists of apparatus for causing the same metal bands to act as breaks on windlass and other barrels.

Secondly, our invention consists of applying breaks to rotating stoppers for cables. And in order that our invention may be most fully understood, and readily carried into effect, we will proceed to describe the means pursued by us.

Description of the Drawings.

Fig. 1, shows a front view of a windlass with apparatus to work the same, according to our invention.

Fig. 2, shows a transverse section thereof.

Fig. 3, shows another windlass with a single barrel, actuated by both ends, according to our invention.

Fig. 4, shows a transverse section of fig. 3, and in like manner may other barrels for raising weights be fitted up. In these figures the same letters of reference are used to indicate the same parts, and such is the case in regard to figs. 5, 6, and 7, where some of the parts are shown on a larger scale than in the previous figures. A, A, are

friction bands of metal, provided with means of adjustment at *a*, *a*, by screws and nuts. One end of the metal band, A, is fixed by a pin-joint to the lever, B, at C, and the other end is affixed by a pin-joint to one end of the link, A', the other end of such link is fixed to the lever, B, by a pin-joint; hence when the lever, B, is raised it will cause the ends of the flexible metal strap to embrace the barrel and hold it fast, and by its ascent cause the barrel to turn partly round, and the descent of the lever, B, will cause the metal strap to open and be free of the barrel; hence the descent of the lever, B, will have no effect on the barrel, by which arrangement the repeated ascent of the lever, B, will cause the windlass or other barrel to which this apparatus is applied to rotate. The lever, B, is alternately raised and lowered by the lever, X, and the rods, K, as shown, or by other convenient apparatus. The windlasses shown in the drawing, each have two metal bands, and they come into action in succession. When it is desired to pay away the cable, the palls, L, are lifted out of the way by means of the lever, M, on the axis of which is an excentric, N, which lifts the palls out of the way when the lever is brought down into the position of dotted lines, *m*. In order to keep the metal bands in use as breaks, or to hold them out of action altogether, and allow of the same rotating freely when the cable is running out, the lever, H, is used, which moves on an axis at one end, as shown. F, is a beam moveable on an axis, carried by the lever, H, as shown. E, E, are connecting rods, attached by pin joints to the levers, B, by which the metal straps are kept under control of the lever, H. We would remark that we are aware that it has before been proposed to give motion to windlass barrels by straps, but in such case the strap was lined with wood, which is highly objectionable; we do not, therefore, claim the use of metal straps for such purposes when so lined with wood, but we form such metal bands so that metal surfaces may come against the barrel which is to be moved thereby, and which are important improvements in such apparatus.

The second part of our invention consists of improvements in stoppers used with chain cables.

Fig. 8 shows a plan,

Fig. 9 a side view; and

Figs. 10 and 11, sections of apparatus according to this

part of our invention. o, is a barrel formed with a groove, into which the vertical links of a chain cable enter, whilst the horizontal links come against the horns or projections, *o*, *o*, and if no impediment be offered to the rotation of the barrel, o, as the chain runs out the barrel, o, will rotate, by reason of the horizontal links of the cable coming against the projections, *o*, *o*, in succession, but the object of this part of the invention is to employ a break to such barrels, so that the running out of the cable may be controlled and stopped when desired. P, is a metal break, which is caused to press more or less on the barrel so as to retard its rotation, or if desired stop it altogether, and when it is desired to hold the barrel from further rotation, the screw, Q, is screwed down, so as to retain the friction-strap in contact with the barrel.

Having thus described the nature of our invention and the manner of performing the same, we would have it understood that we do not confine ourselves to the details herein shown and described, as the same may be varied, so long as the peculiar character of either part of our invention be retained.

But what we claim is,

First, the mode of using metal straps and apparatus to windlass, and other barrels, to give motion thereto; and,

Secondly, we claim the means of controlling barrels used as stoppers for chain cables.—In witness, &c.

GEORGE WILLIAM LENOX.
WILLIAM ROBERTS.

Enrolled August 28, 1850.

Specification of the Patent granted to JOHN SCOFFERN, *of Essex-street, in the County of Middlesex, for Improvements in the Manufacture and Refining of Sugar, and in the Treatment and Use of Matters obtained in such Manufacture, and in the Construction of Valves used in such and other Manufactures.*—Sealed February 21, 1850.

WITH AN ENGRAVING.

To all to whom these presents shall come, &c., &c.—My invention consists,

First, of an improvement in the manufacture and refining of sugar when using subacetates of lead.

Secondly, my invention consists of manufacturing a pigment of lead by applying sulphate of lead.

And, thirdly, my invention consists of improvements in valves suitable for the pumps used when forcing sulphurous acid gas into syrups, and such valves are also applicable to pumps where the fluid is to be forced in one direction and prevented returning; and in order that the invention may be most fully understood and readily carried into effect, I will proceed to describe the means pursued by me.

In the specification of my former patent,* I described the use of subacetates of lead to the defecation of the saccharine solutions, and I have since found that the best means of using the acetate of lead as a defecation for cane juice is as follows:—

The juice being received in a vessel (copper or iron), to which heat can be applied (steam heat by preference), gradually raise the temperature to about 210 deg. Fahrenheit, skimming all the time, so as to remove impurities as they arise; then boil until the juice shall have acquired one degree of density, or thereabouts, when examined by Beaume's saccharometer, over the original density of the cane juice, and for equal temperatures. Then remove the source of heat so as to let the juice fall below the degree of boiling, but as little as possible, then add the subacetate of lead, previously reduced by admixture with water to the condition of a thin paste, and incorporate well by stirring. As to the quantities of lead salt, I have usually found one-sixth per cent. to suffice.

I will now describe the second part of my invention, which consists of the manufacture of a new pigment of lead, by applying sulphate of lead. In employing subacetates of lead in the manufacture and refining of sugar, and then throwing the lead down by sulphurous acid, sulphate of lead is formed, and I have found that this white powder has peculiar properties (when used as a pigment) of retaining its white colour, not being liable to blacken by the action of hydro-sulphuric acid, and, at the same time, it offers a good body, and, as it is technically termed, "*covers*" well. The sulphate of lead when obtained is to be treated and made up into a pigment, and

* See "Repertory," vol. xiii. p. 37, E. S.

used in like manner to ordinary white lead. I would remark, that although it is convenient thus to employ the otherwise refuse product of sulphate of lead obtained in the manufacture and refining of sugar, still the same manufacture of a pigment may be produced by sulphate of lead obtained in like manner from other solutions containing subacetate of lead.

I will now describe the third part of my invention. Fig. 1, shows a tube with an elastic valve, formed according to this part of my invention. Fig. 2, shows the tube without the valve; and fig. 3, is the elastic band used in forming the valve. The tube, *a*, is closed at its lower end, and it is perforated with numerous small holes, as shown. *b*, is the elastic band, which I make of vulcanized India-rubber, and which fits tightly around the tube, *a*, as shown. By this arrangement a valve is made, which will allow of gases and other fluids being forced through from the interior outwards, but the elastic band will immediately close and prevent any return.

Having thus described the nature of my invention and the manner in which the same is to be performed, I would have it understood that I do not confine myself to the details herein described, as the same may be varied, so long as the peculiar character of any part of my invention be retained.

But what I claim is,

First, the improvement herein described in the manufacture and refining of sugar.

Secondly, I claim the manufacture of a pigment by employing sulphate of lead.

And, thirdly, I claim the construction of valve herein described.—In witness, &c.

John Scoffern.

Enrolled August 21, 1850.

Specification of the Patent granted to Thomas Whiffen, *of Pig Quay, Bridewell Precinct, Accountant, for Improvements in Registering the Delivery of Goods.*—Sealed February 21, 1850.

To all to whom these presents shall come, &c., &c.—

Gas is the only article in common use, the delivery of which is registered by itself. Of late some attempts have been made to apply the principle to liquids, but no mechanical means have hitherto been used to count dry goods, many of which from their being sold in regular quantities offer no facilities for being so registered. Coal and corn may be considered as the most important articles in common use, and they are sold or measured always in certain quantities. Coals from the ships are weighed in two cwts. and a-half, or eighths of a ton; from barges in tenths of a ton or two cwts.; corn in sacks of four bushels.

The machine consists of a metal-box, containing a train of wheels and pinions, which are driven by a rachet and rachet-wheels, which rachet is by means of a weighted lever acted upon by the passage of the goods. The top of the box has a series of dials, from the centres of which the wheel-shafts carry pointers.

In the delivery of coal from the ships, the coal is weighed in a box or vat, hung to one end of the scale-beam, in quantities of two cwts. and a-half, as above stated; the weigher opens a door in front of the vat and the coals are then shot into the barge. In this case the register is attached to the side of the box containing the coals, and is acted upon by the door, which on opening allows the weighted lever to drop, and on closing lifts it up to its original position. Thus the opening and shutting of the vat-door necessary to the allowing the weigh of coals to pass, is made the means of effecting the registry of that quantity. The method hitherto used is, for the weigher to make a chalk mark for each weigh of coals.

In the register used for this purpose the rachet-wheel is divided into eight teeth, and as the wheel is moved round to the extent of one tooth, by each weigh of coal, which is the eighth part of a ton, one entire revolution is given to the wheel and its pointer by the passing of one ton: the dial corresponding to this by being divided into eighths; the other wheels and pinions having the proportion of ten to one, the reading of the dials is, parts of a ton, tons, tens of tons, &c. When the ship is cleared the pointers are released from their position and again placed at zero.

In the register for use at coal-wharves where the quantities measured are tenths of a ton, the rachet-wheel and its dial are divided into ten. The necessary motion is given to the weighted lever attached to the rachet by such means as may be found best adapted to the circumstances of each wharf, some of which are as follows:—A piece of wood or plate of iron is hung vertically in such manner that it will freely assume a horizontal position in one direction only, and as freely return by its own weight. This vertical board is suspended over the plank or place by which the men carrying the coals pass, and is struck by the top of the sack itself in the direction in which the board will move, the upward motion thus given to the board and the downward one caused by the fall of the board on being released by the sack passing from under it, is made by means of a series of levers to give the necessary motion to the weighted lever of the register, which may be fixed in an adjoining counting-house, or other convenient place.

Or a horizontal bar may be so placed that the man when carrying the sack, strikes it with his breast in passing, and which returns by means of a spring when released. Or the plank up which it is necessary for the men to pass may be made to rest on a spring, which will only assume a certain position when pressed by the weight of a man laden with a sack; the motion in either of these cases is conveyed by levers to the register.

The methods here described will apply equally to sacks of corn.

Any other kind of goods may be made to communicate motion to the register by means as described, or some other more suitable to the exigencies of each case, and the rachet-wheel and dials may be divided as most proper.—In witness, &c.

THOMAS WHIFFEN.

Enrolled August 21, 1850.

Specification of the Patent granted to Brereton Todd, *of the Bank, Falmouth, Gentleman, for Improvements in the Manufacture of Arsenic, Sulphuric Acid, and the Oxide of Antimony from Copper and other Ores in which they are combined, and also the Oxide of Zinc.*—Sealed February 27, 1850.

To all to whom these presents shall come, &c., &c.—The principal feature of the invention consists in submitting uncalcined or unroasted copper and other ores to the oxidating and reducing flame of a blast-furnace in connexion with flues and chambers, and also in making the spare heat of the said blast-furnace applicable in a reverberatory furnace, oven, or retort, by which process the volatile and non-volatile products are obtained and made marketable, as hereinafter stated.

The mode of operation is as follows:—The furnace having been charged with fuel and heated to the required temperature, enough fuel being introduced so as to rise to a sufficient height above the tuyere, a charge of ore in its raw state, either with or without any suitable flux, according to the nature of the ore, is to be put in on the top of the fuel, (much depends on the power of the blast used, and if a reverberatory-furnace is attached to the blast-furnace in the process, as to the number of alternate layers of fuel and ore to be introduced at one time of charging,) and the charging aperture immediately closed and luted. When the charge sinks below a certain depth, which can be easily ascertained by experience, it is to be replenished. In the same manner, should a calcining or roasting furnace attached and heated by the said blast-furnace be used, a charge of ore is to be introduced into it during the time of charging the blast-furnace, and it can be stirred at the time of putting in the succeeding charges. When considered sufficiently roasted it may either be drawn out or pushed towards the blast-furnace to be fused, and a fresh charge introduced.

As regards the manufacture of arsenic, I take copper and other ores in which it is contained, commonly known as arsenical ores, and submit them without any previous calcination or roasting to the action of a blast-furnace, as above described, into which they are placed

for the purpose of separating the arsenic in the form of vapour from the non-volatile metals contained in the ore. The arsenic is volatilized, and the non-volatile metals in the state of regulus fall with the scoria into the lower part of the furnace and separate by difference of gravity, (the regulus sinking under the scoria or slag,) and are tapped off at different levels. I also put a charge of the same sort of ore into the calciner or furnace, through which the vapours and gases from the above blast-furnace pass. The volatilized arsenic is carried off with the gases arising from combustion, and passes into the flues and chambers where it is condensed in the state of oxide, whence it is removed and purified by being re-sublimed by the well-known processes now in general use, and any copper or zinc that may have been volatilized, will be found in the refuse.

As regards the manufacture of sulphuric acid, I take the sulphuret of copper or of iron, and without any previous roasting or calcination submit them to the process, as above described, for the arsenical ores; the volatilized sulphur is carried off with the gases arising from combustion, and passes through the flues into the chambers in the state of sulphurous gas, where it is to be converted into sulphuric acid by causing it to come in contact with steam and oxygen, as generally practised.

As regards the manufacture of oxide of antimony, I take ores mingled with antimony, and submit them without any previous roasting or calcination to the same process as above described for arsenical ores; the volatilized antimony is carried off with the gases arising from combustion, and passes into the flues and chambers, where it is condensed in the state of oxide of antimony, which oxide I purify by re-subliming in a reverberatory furnace and condensing the fumes in flues or chambers. Should the ores operated on contain the sulphuret of lead, it will be volatilized and found principally deposited in the flue nearest the furnace in the state of sulphuret of lead, and that portion mingled with the oxide of antimony previous to its re-sublimation will be left in the reverberatory furnace in the state of oxide of lead.

Or, take the above ores containing antimony and submit them to a process of calcination in a reverberatory furnace, and condense the volatilized antimony in the state of oxide in flues and chambers, at the same time allowing

the sulphur the ores contain to fly off in the state of sulphurous gas.

As regards the manufacture of the oxide of zinc, I take copper and other ores containing zinc, and, without any previous calcination or roasting, submit them to the same process as above described for arsenical ores. The volatilized zinc is carried off with the gases arising from combustion, and passes into the flues and chambers, where it is condensed in the state of oxide. The principal part of the sulphur with which the zinc was mineralized is driven off in the state of sulphurous gas, but may be converted into sulphuric acid as above described, and condensed with the oxide of zinc so as to form sulphate of zinc; the above oxide of zinc is to be deprived of any arsenic or sulphur that may have been condensed with it by calcination or roasting in a reverberatory furnace or retort, and the arsenic or sulphur made available by being condensed as above described. Should the ores operated on contain any sulphuret of lead, it will be volatilized with the oxide of zinc, and be found principally in the flue nearest the furnace in the state of sulphuret of lead; should any be mixed with the oxide of zinc, it is to be calcined until the lead contained in it is converted into the state of oxide, and may be then separated either by washing, (as, owing to the gravity of the oxide of lead, it sinks before the oxide of zinc,) or by reducing the oxide of lead at a heat not sufficient to reduce the oxide of zinc, or applied as mingled oxides for glaze or glitter, for which purpose I also apply the above sublimed sulphuret of lead.

I claim the invention of submitting copper and other ores for the purposes herein described, without any previous roasting or calcination, to the action of a blast furnace in connexion with flues and chambers of sufficient size to condense the volatile products, and by the same process obtain the metallic substances that do not volatilize in the state of regulus.

Also of employing the spare heat of the said blast furnace in a calciner, or furnace attached to the same, for subliming arsenic, sulphur, and other volatile substances from the above-named ores.

Also the manufacture of arsenic, sulphuric acid, oxide of antimony, oxide of zinc, sulphate of zinc, as above described.

Also the subliming of the sulphuret of lead from the

above ores, and the condensing of the same, and the separating of it from the oxide of zinc as above described. —In witness, &c.

BRERETON TODD.

Enrolled August 27, 1850.

Specification of the Patent granted to DAVID WILLIAMS WIRE, *of St. Swithin's-lane, London, Gentleman, for An Improved Manufacture of Candles and other like Articles used for affording Light.*—Sealed December 15, 1847.—(Communication.)

To all to whom these presents shall come, &c., &c.— My invention consists in the introduction of a large proportion of resin into fatty or oily substances for the purpose of manufacturing candles and other like articles used for affording light, and which I am enabled to do so effectually as to produce a very superior candle, at a comparatively very cheap price. I should observe, that there are two ways of introducing the required quantity of resin, to form the compound material of which the candle is to be made, one being with the addition of chlorine, and the other without that medium; but, as various experiments which I have made have convinced me that the compound of which I manufacture my candles is equally good when chlorine is not used, and the process is then more simple and less expensive, I will confine myself to a description of the latter process, which is as follows :—A certain proportion of resin, generally from twenty to thirty per cent., is added to any suitable fatty, or acid fatty, or oleaginous substance, and when melted together, a quantity of strong acid, such as concentrated sulphuric acid, is introduced in very small quantities at a time, and the whole submitted to a degree of heat sufficient to cause the evaporation of sulphurous acid gas. The operation will require from twelve to eighteen hours, but needs no further description, as it is well known, having been long applied to fatty substances for the manufacture of candles when not combined with resin. When the evaporation is complete, and the compound substance is cooled, it will then have a dark brown and crystalline appearance. This compound substance is then submitted to distillation by the well-

known means adopted for the distillation of fatty or fatty acid, or oleaginous substances, either by means of heated steam, or heated steam and vacuum combined, these modes also being too well known to require further description. The compound substance thus obtained is then pressed, to separate the liquid from the solid part, and the latter may in that state be made into candles, tapers, mortars, and such like articles for affording light.

Having now described the nature of the said invention, and the manner in which the same is to be performed, I hereby declare that what I claim as the said invention is only the combination of resin and suitable fatty or fatty acid, or oleaginous substances, in such manner as to form a suitable and partly resinous compound substance, for the manufacture of candles and other like articles used for affording light, whereby I am enabled to produce such articles at a much cheaper rate than heretofore.—In witness, &c.

DAVID WILLIAMS WIRE.

Enrolled June 15, 1848.

Specification of the Patent granted to HENRY JAMES TARLING, *of Bayswater, in the County of Middlesex, Commission Agent, for Improvements in the Manufacture of Fuel and Manure, and deodorizing and disinfecting Materials.*—Sealed March 7, 1850.

To all to whom these presents shall come, &c., &c.—My invention consists,—

First, of improvements in the manufacture of fuel, by the employment of refuse tan and gas-tar combined together, as will be afterwards described; and in the use of refuse tan, and resin oil and peat, and resin oils; and also in the use of peat and gas-tar. The mode of preparing the fuel is as follows:—I take one bushel of refuse tan, having been previously dried, and mix with it about one quart of gas-tar, in the state it comes from the gas-works. These materials are well combined together by stirring, and in that state it may be burnt as fuel, or it may be pressed in moulds to any required form; the same pro-

cess is followed when using the peat and gas-tar, the peat being dried and broken into small pieces, and when in that state the tar is added, and the whole stirred and combined together as before. In mixing these materials together, if the fuel is required to be more inflammable, owing to the badness of draft of the furnace where it is to be burnt, then an additional quantity of tar is to be added.

When manufacturing fuel from refuse tan and resin oil, or peat and resin oil, I find the proportion most suitable to be about one pint of oil to one bushel of peat or tan.

I am aware that peat and tan have been before employed, when combined with other matters for the manufacture of fuel; I do not, therefore, claim the same when separately considered, nor do I confine myself to the precise proportions of the materials given, as they may be varied. But what I claim is, the manufacture of fuel, by the employment of refuse tan when combined with gas-tar, also peat and gas-tar, and peat and resin oil, and refuse tan and resin oil, as herein described.

My improvements in the manufacture of manure consist of combining highly carbonized refuse tan with night-soil, which materials are to be mixed together in about equal quantities; but I do not confine myself to the exact proportions. I am aware that it has been before proposed to use refuse tan with other matters as a manure; I do not, therefore, claim the use of refuse tan generally.

But what I claim as my invention in the manufacture of manure is, the employment of highly carbonized refuse tan when combined with night-soil, as herein described; and I also claim the employment of this highly carbonated refuse tan, which is converted into a charcoal, for the purpose of disinfecting or deodorizing night-soil, and other various matters; and I find from experiments that the quantity sufficient for such purposes is about an equal part in measure of this carbonized tan to the quantity of matter operated upon.—In witness, &c.

HENRY JAMES TARLING.

Enrolled September 7, 1850.

SCIENTIFIC MISCELLANEA.

ON THE ASSOCIATION OF SILVER WITH METALLIC MINERALS, AND METHODS OF EXTRACTING IT.

BY MM. MALAGUTI AND DUROCHER.

In a former memoir the authors showed that silver exists in many metallic sulphurets, in which its presence had not been suspected, and they are now able to state that most of them contain silver, even when not coming from situations in which this metal is extracted. Thus, of more than two hundred specimens examined, only about one-twentieth contained no silver. Many, indeed, contained traces only, and there would have been some uncertainty if the usual methods of assaying had not been modified.

It was soon discovered that the humid process is totally inapplicable in such researches; litharge was then prepared almost without silver, and the purity of the fluxes and the other reagents employed was ascertained. Afterwards the conditions under which the fusions should be performed, so as to lose as little as possible, were determined, and they ascertained that buttons of silver, which weighed the sixteenth of a milligramme, did not disappear in cupellation, even when allied with thirty grammes of lead.

In the experiments performed on the roasting of various sulphurets, the authors were surprised on finding that silver contained in blendes would lose more than half by sublimation. In certain cases this metal, therefore, volatilizes much more readily than was supposed: it incrusted the surfaces of the apparatus employed; the same happens to the silver in roasting galenas; this fact explains an important metallurgic fact, which is, that, notwithstanding the precautions taken to collect pulverulent cadmium in the condensation chambers, there is always a considerable loss of silver, which is carried up, and fixed on the surface of the apparatus, that it cannot be detached; this was shown to be the case by experiments.

Silver is unequally diffused in the various metallic compounds; thus oxides and saline combinations are

always poorer than sulphurets, and among the latter, the compounds with a radical of iron are generally less rich in silver than those of lead, copper, and zinc. These remarks on the unequal distribution of silver in natural substances are moreover confirmed by what passes in the operations in the dry way, whether performed in the laboratory or metallurgic establishments.

The universal diffusion of silver in the mineral kingdom induces the belief that other metals are perhaps as widely disseminated in nature; this is already known to be the case with iron. With this view the authors examined crystalline minerals possessing all the characters of purity. Twelve specimens of galena, besides silver, contained very sensible quantities of iron, copper, and zinc.

In order to ascertain the state in which silver is associated in small quantity in various metallic minerals, and especially in sulphurets, sulpho-arseniurets, and sulpho-antimoniurets, such reagents were first employed as were supposed capable of acting upon metallic silver, and not upon its sulphuret, especially when it is combined with other metallic sulphurets. Neither liquid chlorine, bichloride of copper, nor persulphate of iron gave very positive results; mercury yielded more precise indications: of thirty-eight specimens operated upon, and of which some were considerably rich, eleven only yielded to mercury a part of their silver. The comparison of results deduced from experiments made under similar conditions upon substances into which metallic silver or its sulphuret had been in various ways introduced, led to the conclusion that the silver, probably, does not exist in the same state in all sulphurets, containing small quantities of it, but that it is most frequently combined in the state of sulphuret with the substance which it accompanies.

The authors have completed their preceding experiments, demonstrating that metallic sulphurets cannot contain silver in the state of chloride or bromide; and they have noticed some remarkable reactions occurring between chlorides and sulphurets. The authors divide these into three groups:—1st, bimolecular sulphurets, such as those of zinc, cadmium, lead, &c.; 2dly, sulphurets, possessing several molecules of sulphur, and capable of parting with some of it, bisulphuret of tin for example;

3dly, sulphurets not saturated with sulphur and susceptible of combining with it, such as the protosulphuret of copper.

The first re-act upon the chloride of silver by double decomposition; the second undergo partial reduction, becoming protosulphuret; the last partly reduce the chloride of silver, and also act upon it by double decomposition.

The arseniurets, sulpho-arseniurets and sulpho-antimoniurets, placed in the same circumstances, produce upon the chloride of silver an action resembling that of the sulphurets.

These different bodies were added to chloride of silver dissolved in ammonia, and sometimes in hydrosulphite of soda; but it was found that the presence of the solvent produced no other effect than that of accelerating the phænomenon, and rendering observation of it more commodious, but it did not alter the essential conditions of it.

It is remarkable to observe that the decomposition produced by the sulphurets, arseniurets, &c., is often as complete as if the operation was conducted on bodies dissolved in water. As examples of this, may be cited native sulphuret of copper, arseniuret of antimony, arsenical cobalt, arsenical nickel, &c. Certain sulphurets, though but few, do not act; such for example are the sulphuret of mercury and gray cobalt, which in this respect differs much from gray nickel. Metallic iron resembles it in this respect, that it does not precipitate—or but very slightly—silver from solution in the form of concentrated ammoniacal chloride, or even in the form of nitrate.

The power of sulphurets to decompose chloride of silver is generally more marked in those which act by way of reduction, than in those which produce double decomposition; moreover this power appears to have relation to the electro-chemical state of the metals. It must also be added, that various minerals belonging to the same species possess decomposing powers varying according to their different composition, crystalline form, density, and cohesion.

Bromide of silver, put into contact with metallic sulphurets, offers the same phænomena of decomposition as the chloride. In short, all these facts appear to depend

upon a general law of the reactions of the sulphurets on the chlorides, and of insoluble on soluble salts. Moreover, the authors find that these reactions are produced in the dry as well as in the humid way: thus, galena decomposes chloride of silver in fusion; blende was found to detain the vapour of this chloride and to convert it into sulphuret of silver. The same vapour is also decomposed with the assistance of heat by quartz, felspar, argil, and silicates in general.

The reactions of sulphurets on chlorides, produced under such various circumstances, evidently possess a general character, and the observation of various metalliferous deposits offers additional confirmation of it; for the chloride and bromide of silver do not occur among the same metallic sulphurets, but in the upper parts of veins, which have been altered and oxidized by the influence of external causes. The authors also deduce from their experiments, the explanation of certain geological phænomena; for example, the concentration which the mineral of native and sulphuret of silver of the veins of Konigsberg has undergone; a mineral which occurs agglomerated by schistose bands impregnated with various metallic sulphurets, as iron and copper pyrites, blende, and galena.—*Comptes Rendus*, Decembre 10, 1849.

ELECTRO-MAGNETISM AS A MOTIVE POWER.

Professor Page, in the lectures which he is now delivering before the Smithsonian Institution, states that there is no longer any doubt of the application of this power as a substitute for steam. He exhibited the most imposing experiments ever witnessed in this branch of science. An immense bar of iron, weighing 160 lbs., was made to spring up by magnetic action, and to move rapidly up and down, dancing like a feather in the air, without any visible support. The force operating upon the bar he stated to average 300 lbs. through ten inches of its motion. He said he could raise this bar 100 feet as readily as ten inches, and he expected no difficulty in doing the same with a bar weighing one ton, or a hun-

dred tons. He could make a pile-driver, or a forge hammer, with great simplicity, and could make an engine with a stroke of six, twelve, twenty, or any number of feet. The most beautiful experiment we ever witnessed was the loud sound and brilliant flash from the galvanic spark, when produced near a certain point in his great magnet. Each snap was as loud as a pistol; and when he produced the same spark at a little distance from this point, it made no noise at all. This recent discovery is said to have a practical bearing upon the construction of an electro-magnetic engine. He then exhibited his engine of between four and five horse-power, operated by a battery contained within a space of three cubic feet. It looked very unlike a magnetic machine. It was a reciprocating engine of two feet stroke, and the whole engine and battery weighed about one ton. When the power was thrown on by the motion of a lever, the engine started off magnificently, making 114 strokes per minute; though when it drove a circular saw, ten inches in diameter, sawing up boards an inch and a quarter thick into laths, the engine made but about eighty strokes per minute. The force operating upon this great cylinder throughout the whole motion of two feet was stated to be 600 lbs. when the engine was moving very slowly; but he had not been able to ascertain what the force was when the engine was running at a working speed, though it was considerably less. The most important and interesting point, however, is the expense of the power. Professor Page stated that he had reduced the cost so far that it was less than steam under many and most conditions, though not so low as the cheapest steam-engines. With all the imperfections of the engine, the consumption of 3 lbs. of zinc per day would produce one-horse power. The larger his engines, contrary to what has been known before, the greater the economy. Professor Page was himself surprised at the result. There were yet practical difficulties to be overcome, the battery has yet to be improved, and it remains yet to try the experiment on a grander scale—to make a power of 100 horse, or more.—*National Intelligencer* (American paper).

LIST OF IRISH PATENTS.

From August 24, to September 18, 1850.

GEORGE GWYNNE, of Sussex-square, in the county of Middlesex, Esquire, for Improvements in the manufacture of sugar.—Sealed August 24, 1850.

ROBERT REID, of Glasgow, in the county of Lanark, Manufacturer, for Certain improvements in weaving.—Sealed August 27, 1850.

RICHARD ARCHIBALD BROOMAN, of Fleet-street, for Improvements in types, stereotype plates, and other figured surfaces for printing from.—Sealed September 6, 1850.

JAMES RENNIE, of Gowan Bank, Falkirk, in the county of Stirling, Gentleman, for A certain improvement or improvements in the construction of gas-retorts and furnaces, and in apparatus or machinery applicable to the same.—Sealed September 10, 1850.

PETER FAIRBAIRN, of Leeds, York, Machinist, and JOHN HETHERINGTON, of Manchester, for Certain improvements in machinery or apparatus for preparing, spinning, and weaving cotton, flax, and other fibrous substances; also, in constructing and applying models or patterns for moulding, preparatory to casting parts of machinery employed in preparing, spinning, and manufacturing fibrous substances; and also in certain tools to be used in making such machinery.—Sealed September 13, 1850.

GEORGE THOMPSON, of Park-road, Regent's-park, Middlesex, Gentleman, for Certain improvements in machinery and apparatus for cutting, digging, or turning up earth, applicable to agricultural purposes.—Sealed September 14, 1850.

GEORGE ATTWOOD, of Birmingham, for A new or improved method of making tubing of copper, or alloys of copper.—Sealed September 18, 1850.

LIST OF SCOTCH PATENTS.

From July 30, to September 20, 1850.

WILLIAM EDWARD NEWTON, of Chancery-lane, in the county of Middlesex, Civil Engineer, for Improvements

in machinery or apparatus for making hat bodies, and other similar articles.—Sealed July 30, 1850.—(*Six months.*)

JOHN GWYNNE, of Lansdowne Lodge, Notting-hill, Merchant, for Improvements in obtaining motive power, and in applying the same to giving motion to machinery. Sealed July 31, 1850.—(*Six months.*)

WALTER NEILSON, of Hyde Park-street, in the city of Glasgow, North Britain, Engineer, for Improvements in the application of steam for raising, lowering, moving, or transporting heavy bodies.—Sealed August 2, 1850.—(*Six months.*)

GEORGE GWYNNE, of Sussex-square, in the county of Middlesex, Esq., for Improvements in the manufacture of sugar.—Sealed August 7, 1850.—(*Six months.*)

WILLIAM COX, of Manchester, in the county of Lancaster, Cigar Merchant, for Improvements in machinery or apparatus for manufacturing ærated waters, or other such liquids.—Sealed August 7, 1850.—(*Six months.*)—(Communication.)

WILLIAM EDWARD NEWTON, of Chancery-lane, in the county of Middlesex, Civil Engineer, for Improvements in obtaining, preparing, and applying zinc and other volatile metals and the oxides thereof, and in the application of zinc and ores containing the same, to the preparation or manufacture of certain metals or alloys of metals. —Sealed August 8, 1850.—(*Six months.*)—(Communication.)

MATTHEW GRAY, of No. 3, Morris-place, in the city of Glasgow, in the county of Lanark, Practical Engineer, for An improved method of supplying steam-boilers with water.—Sealed August 9, 1850.—(*Four months.*)

WILLIAM WATT, of the city of Glasgow, North Britain, Manufacturing Chemist, for Certain improvements applicable to inland navigation; which improvements, or parts thereof, are also applicable generally to raising, lowering, or transporting heavy bodies.—Sealed August 13, 1850. —(*Six months.*)

GEORGE AUGUSTUS HUDDART, of Brynkir, in the county of Carnarvon, Esquire, for Certain improvements in the manufacture of cigars.—Sealed August 14, 1850. —(*Six months.*)

JAMES RENNIE, of Gowan Bank, Falkirk, in the county of Stirling, North Britain, Gentleman, for A certain im-

provement or improvements in the construction of gas-retorts and furnaces, and in apparatus or machinery applicable to the same.—Sealed August 14, 1850.—(*Six months.*)

WILLIAM CHARLES BELL, of Manchester, in the county of Lancaster, for Improvements in apparatus connected with water-closets, drains, and cesspools, and gas and air-traps.—Sealed August 14, 1850.—(*Six months.*)

HENRY MEYER, of the Strand, in the county of Middlesex, Gentleman, for Certain improvements in power-looms for weaving. — Sealed August 14, 1850. — (*Six months.*)

READ HOLLIDAY, of Huddersfield, for Improvements in lamps.—Sealed August 14, 1850.—(*Six months.*)

WILLIAM MACNAUGHT, of Rochdale, in the county of Lancaster, Engineer, for Certain improvements in steam-engines, and also improvements in apparatus for ascertaining and registering the power of the same.—Sealed August 16, 1850.—(*Six months.*)

ALFRED HOLL, of Greenwich, in the county of Kent, for Improvements in steam-engines.—Sealed August 16, 1850.—(*Six months.*)

WILLIAM EDWARD NEWTON, of Chancery-lane, in the county of Middlesex, Civil Engineer, for Improvements in the construction of ships or vessels, and in steam-engines, boilers, or generators.—Sealed August 20, 1850. —(*Six months.*)—(Communication.)

EDWARD HIGHTON, of Clarence Villa, Regent's-park, in the county of Middlesex, Engineer, for Improvements in electric telegraphs, and in making telegraphic communications.—Sealed August 21, 1850.—(*Six months.*)

CHARLES WILLIAM LANCASTER, of New Bond-street, in the county of Middlesex, Gunmaker, for Improvements in the construction of fire-arms, cannon, and projectiles, and in the manufacture of percussion tubes.—Sealed August 21, 1850.—(*Six months.*)

WILLIAM DICK, of the city of Edinburgh, Professor of Veterinary Medicine in the Edinburgh Veterinary College, for Improvements in the manufacture of steel and gas.—Sealed August 22, 1850.—(*Six months.*)

THOMAS LUCAS PATERSON, of the city of Glasgow, Manufacturer and Calico Printer, for Certain improvements in the preparation or manufacture of textile mate-

rials, and in the finishing of woven fabrics, and in the machinery or apparatus used therein.—Sealed August 22, 1850.—(*Six months.*)

Henry Houldsworth, of Coltness House, in the county of Lanark, Iron Master, for Improvements in the manufacture of iron and other metals.—Sealed August 28, 1850.—(*Six months.*)

James Hall, of Geecross, in the county of Chester, Machine Maker, for Certain improvements in looms for weaving.—Sealed August 28, 1850.—(*Four months.*)

Robert Westmorland Hutchinson, of Camberwell, in the county of Surrey, Gentleman, for Certain improvements in saw sets, mallets, and other tools; and in apparatus or machinery for manufacturing same.—Sealed August 28, 1850.—(*Four months.*)

Charles Lamport, of Workington, in the county of Cumberland, Ship Builder, for Certain improvements in machinery or apparatus for spinning or twisting cotton and other fibrous substances—Sealed September 2, 1850.—(*Six months.*)

Astley Paston Price, of Margate, in the county of Kent, and James Heywood Whitehead, of the Royal George Mills, Saddleworth, near Manchester, for Improvements in filters.—Sealed September 2, 1850.—(*Four months.*)

Frederick Woodbridge, of Old Gravel-lane, in the county of Middlesex, Engineer, for Improvements in machinery for manufacturing rivets, bolts, and screw blanks.—Sealed September 3, 1850.—(*Six months.*)

Wakefield Pim, of Kingston-upon-Hull, Engine and Boiler Maker, and Builder of Iron Steam-Ships, for Certain improvements in the construction of boilers and funnels of steam-engines.—Sealed September 4, 1850.—(*Four months.*)

William Joseph Horsfall, and Thomas James, both of the Mersey Steel and Iron Works, Toxteth Park, Liverpool, in the county of Lancaster, for Improvements in the rolling of iron and other metals.—Sealed September 6, 1850.—(*Six months.*)

George Attwood, of Birmingham, in the county of Warwick, Copper Roller Manufacturer, for A new or improved method of making tubing of copper and alloys of copper.—Sealed September 6, 1850.—(*Six months.*)

THOMAS PRIESTLEY, of Shuttleworth, in the county of Lancaster, Manager, and RICHARD HURST, of Rochdale, in the same county, Cotton Spinner, for Certain improvements in machinery or apparatus to be used for preparing, spinning, and doubling cotton, wool, flax, silk, and similar fibrous materials; and also in machinery or apparatus for preparing, balling, and winding warps and yarns.—Sealed September 7, 1850.—(*Four months.*)

GEORGE THOMPSON, of 12, Park-road, Regent's Park, in the county of Middlesex, Gentleman, for Certain improvements in machinery and apparatus for cutting, digging, and turning up earth, applicable to agricultural purposes. —Sealed September 16, 1850.—(*Four months.*)

CHRISTOPHER CROSS, of Farnworth, near Bolton, in the county of Lancaster, Cotton Spinner and Manufacturer, for Certain improvements in the manufacture of textile fabrics; also in the manufacture of wearing apparel, and other articles from textile materials, and in the machinery or apparatus for effecting the same.—Sealed September 16, 1850.—(*Four months.*)

JOSEPH LONG, and JAMES LONG, of Little Tower-street, in the city of London, Mathematical Instrument Makers, and RICHARD PATTENDEN, of Nelson-square, in the county of Surrey, Engineer, for An improvement in instruments and machinery for steering ships, which is applicable to vices, and other instruments and machinery for obtaining power.—Sealed September 17, 1850.—(*Six months.*)

JOHN JAMES GREENOUGH, of George-street, Hanover-square, in the county of Middlesex, Gentleman, for Improvements in obtaining and applying motive power.—Sealed September 17, 1850.—(*Six months.*)—(Communication.)

JOHN SIDEBOTTOM, of Broadbottom, in the county of Chester, Manufacturer, for Improvements in looms for weaving.—Sealed September 18, 1850.—(*Six months.*)

JAMES SCOTT, of Falkirk, in the county of Stirling, North Britain, Shipwright, for Certain improvements in docks, slips, and apparatus connected therewith.—Sealed September 20, 1850.—(*Six months.*)

GEORGE ROBBINS, of Forrest Lodge, near Hythe, in the county of Southampton, Gentleman, for Improvements in the construction of railway carriages.—Sealed September 20, 1850.—(*Six months.*)

LIST OF ENGLISH PATENTS.

From September 5, to September 19, 1850.

Sir John Scott Lillie, Companion of the Most Honourable Order of the Bath, of Paris, France, for Certain improvements in the application of motive power.—Sealed September 5, 1850.—(*Six months.*)

John Saul, of Manchester, in the county of Lancaster, Cotton Spinner, for Certain improvements in machinery or apparatus for spinning and twisting cotton and other fibrous substances.—Sealed September 5, 1850. —(*Six months.*)

George Smith, of Manchester, in the county of Lancaster, Engineer, for Certain improvements in steam-engines, and also improvements in feeding or supplying the boilers of the same, part or parts of which improvements are also applicable to other similar purposes.—Sealed September 5, 1850.—(*Six months.*)

William Watt, of the city of Glasgow, North Britain, Manufacturing Chemist, for Certain improvements applicable to inland navigation, which improvements or parts thereof are also applicable generally to raising, lowering, or transporting heavy bodies.—Sealed September 5, 1850.—(*Six months.*)

Andrew Barclay, of Kilmarnock, in the county of Ayr, North Britain, Engineer, for Improvements in the smelting of iron and other ores, and in the manufacture or working of iron and other metals, and in certain rotary-engines and fans, machinery, or apparatus, as connected therewith.—Sealed September 5, 1850.—(*Six months.*)

William Erskine Cochrane, of Cambridge-terrace, Regent's-park, in the county of Middlesex, and Henry Francis, of Princes-street, Rotherhithe, for Improvements in propelling, steering, and ballasting vessels in the pistons of steam-engines, in fire-bars of furnaces, and in sleepers of railways.—Sealed September 5, 1850.—(*Six months.*)

Frederick Woodbridge, of Old Gravel-lane, in the county of Middlesex, Engineer, for Improvements in machinery for manufacturing rivets, bolts, and screw-blanks.—Sealed September 5, 1850.—(*Six months.*)

James Mather, the younger, of Crow-Oaks, Pilkington, in the county of Lancaster, Bleacher, and Thomas Edmeston, of the same place, Calenderman, for Certain improvements in machinery or apparatus for scouring, finishing, and stretching woollen, cotton, and other woven fabrics.—Sealed September 5, 1850.—(*Six months.*)

Christopher Cross, of Farnworth, near Bolton, in the county of Lancaster, Cotton Spinner and Manufacturer, for Certain improvements in the manufacture of textile fabrics; also in the manufacture of wearing apparel and other articles from textile materials; and in the machinery or apparatus for effecting the same.—Sealed September 5, 1850.—(*Six months.*)

John Beattie, of Liverpool, in the county of Lancaster, Engineer, for Certain improvements in steering vessels. —Sealed September 5, 1850.—(*Six months.*)

James Rennie, of Gowan Bank, Falkirk, in the county of Stirling, in the Kingdom of Scotland, Gentleman, for A certain improvement or improvements in the construction of gas retorts and furnaces; and in apparatus or machinery applicable to the same.—Sealed September 5, 1850.—(*Six months.*)

Pierre Erard, of Paris, for Improvements in the construction of piano-fortes.—Sealed September 12, 1850.—(*Six months.*)

Robert Longdon, the younger, of Derby, in the county of Derby, Glove Manufacturer, and Thomas Parker Tabberer, of Derby aforesaid, Manufacturer of Elastic Fabrics, for Improvements in the manufacture of looped fabrics.—Sealed September 12, 1850.—(*Six months.*)

Astley Paston Price, of Margate, in the county of Kent, Chemist, and James Heywood Whitehead, of the Royal George Mills, Saddleworth, near Manchester, for Improvements in filters.—Sealed September 12, 1850.—(*Six months.*)

THOMAS LUCAS PATERSON, of the city of Glasgow, North Britain, Manufacturer and Calico Printer, for Improvements in the preparation or manufacture of textile materials, and in the finishing of woven fabrics, and in the machinery or apparatus used therein.—Sealed September 12, 1850.—(*Six months.*)

RICHARD ARCHIBALD BROOMAN, of Fleet-street, in the city of London, for Improvements in purifying water, and preparing it for engineering, manufacturing, and domestic uses.—Sealed September 19, 1850.—(*Six months.*)—(Communication.)

HENRI JEREMY CHRISTEN, of Paris, Engraver, for Improvements in cylinder printing.—Sealed September 19, 1850.—(*Six months.*)

JASPER WHEELER ROGERS, of Dublin, Civil Engineer, for Certain improvements in the preparation of peat, and in the manufacture of the same into fuel and charcoal.—Sealed September 19, 1850.—(*Six months.*)

WILLIAM ECCLES, of Walton-le-Dale, in the county of Lancaster, Cotton Spinner, for Certain improvements in looms for weaving.—Sealed September 19, 1850.—(*Six months.*)

SAMUEL BRISBANE, of Manchester, in the county of Lancaster, Patten Maker, for Certain improvements in looms for weaving.—Sealed September 19, 1850.—(*Six months.*)

JAMES NASMYTH, of Patricroft, in the county of Lancaster, Engineer, and JOHN BARTON, of Manchester, in the same county, Copper Roller Manufacturer, for Certain improvements in machinery or apparatus for printing calicoes and other surfaces; and also improvements in the manufacture of copper or other metallic rollers to be employed therein, and in the machinery or apparatus connected with such manufacture.—Sealed September 19, 1850.—(*Six months.*)

apply it to new materials; but I repeat, if every man who finds out that it is applicable to a particular fuel to which it has not been used, if he is entitled to a patent to give him the exclusive use, I say Mr. Neilson's patent is of very little use.

Now I beg to call your attention to Mr. Neilson's patent and its terms before I come to Mr. Crane's. The patent is stated to be for "an improved application of air to produce heat in fires, forges, and furnaces, where bellows or other blowing apparatus are required." Pray what is the limitation of the use of that patent? Has there been any attempt to impeach the patent? No; Mr. Crane, when he was not interested to dispute the patent, knew better. Whether he advised with Mr. Carpmael then, or who else, I do not know, but no doubt he advised with somebody. Mr. Carpmael drew his specification, and that Mr. Carpmael had read Mr. Neilson's specification there can be no doubt. Who then thought of disputing Mr. Neilson's patent? Was it known whether Mr. Neilson continued to apply the apparatus of a given size, precisely the form with which he had begun. No doubt it must have been known that he had varied that form, but was it considered that that was any such variation of principle as destroyed his patent? Not the least in the world, for long after this Mr. Crane, who, if he knew anything about it, must have known the modified form in which the principle had been applied; for you know that a patent is good, not by reason of the precise and particular form which is adopted, but it is the principle of the invention which oftentimes may be applied in a great variety of ways. You know it is the principle of the invention which is protected, and that juries are generally occupied in hearing evidence of attempts to evade it, and forming their judgment whether or not this or that particular mode of effecting the same object is or is not a colourable imitation and pretended variation, retaining all the substance of the patent; whether that is the case is more generally the subject for the consideration of the jury than the validity of the patent itself. Nobody has dreamt of disputing Mr. Neilson's patent, Mr. Crane least of all, who, whatever benefit he has got, he has got it under Mr. Neilson's sanction, with Mr. Neilson's instruction and assistance. The title of the patent, therefore, is a patent for the

improved application of air to produce heat in fires, forges, and furnaces, where bellows or other blowing apparatus are required.

The Lord Chief Justice.—Quite general.

The Solicitor-General.—Yes, my Lord. Now you will observe what is the present attempt, that if any man discovers a forge or furnace to be used with any new description of fuel, or to be applied to any other purpose, Mr. Neilson's patent is not applicable to that, but it may be the subject of a new and exclusive patent right. There is no foundation for it. When he comes to specify, he declares "that the nature of my said invention for the improved application of air to produce heat in fires, forges, and furnaces, where bellows or other blowing apparatus are required, and the manner in which the same is to be performed is particularly described and ascertained as follows, that is to say:—A blast or current of air must be produced by bellows or other blowing apparatus in the ordinary way, to which mode of producing the blast or current of air this patent is not intended to extend." Those who choose to retain the old form of bellows or fan are at liberty to do so; Mr. Neilson does not claim that as new; his patent is not for that state of things; he only claims that his hot blast can be used in connexion with that species of apparatus. Having stated what it is not intended to be applied to, he proceeds to state what it is. He says,—"The blast or current of air so produced, is to be passed from the bellows or blowing apparatus into an air vessel or receptacle made sufficiently strong to endure the blast, and through and from that vessel or receptacle by means of a tube, pipe, or aperture into the fire, forge, or furnace." That is, the air is to be introduced into a vessel or receptacle, and to pass out by means of a tube, pipe, or aperture into the fire, forge, or furnace—it is to be a vessel or receptacle. I have before stated that specifications on subjects of this sort are supposed to be addressed to men of some practical science, men who have the means of considering and of estimating the effect of the particular concern to which it is to be applied, of adopting the principle in such form as the particular instance may demand. He tells you it is to be a vessel or receptacle, indicating that it is quite immaterial what particular and precise receptacle it should be; it is to be one which shall be modified

according to that to which it is to be applied. The word vessel is very general, something which would contain air, and that is all the description he gives of it. Need he give more? Why, he is addressing persons who are connected with furnaces and forges and the application of air; he therefore deals in general terms, well knowing that those general terms are abundantly sufficient to put the mind at work, and to give every facility which can be required to accomplish the object which the patent proposes to attain. He says, "The air vessel or receptacle must be air-tight or nearly so, except the aperture for the admission and emission of the air, and at the commencement and during the continuance of the blast it must be kept artificially heated to a considerable temperature." What temperature should that be? Why, that must depend upon the manufacture. One manufacture would require one degree of temperature and another would require a different degree. As his application of the hot blast is intended for furnaces, air furnaces generally, which are applicable to an infinite variety of manufactures, that infinite variety varying in every possible degree in intensity of the temperature also required, so he tells you, that it must be heated to a considerable temperature; but in that part of the specification he does not give you any precise number of degrees to which it is to be heated: "It is better that the temperature should be kept to a red heat or nearly so." What is the degree of temperature which will give red heat? Why, you hear it is a degree abundantly sufficient for all the purposes of this particular manufacture, and more. It exceeds the 600°, which is said to be an adequate degree of temperature, the temperature at which it is said lead will melt, and which is perfectly adequate to the purpose of this manufacture. He says, it is to be "red heat, or nearly so." What is the evidence you have heard of some of the early forms in which this patent was applied? Why, that it was red or reddish, or a tint of red, or approaching to red heat. He says, that it is better it should be kept to a red heat, or nearly so, that red heat exceeding what is necessary for this particular purpose; and every man in every manufacture must bring to a subject of this description, where you have to apply a general power, a power which has not been created with a view to limitation in its

application to a particular manufacture, where a certain degree of heat only is required and no more, but of universal application, each man in his own manufacture must ascertain and know what is the degree of temperature which suits that manufacture. This, as a general standard, he tells you; it should be kept to a considerable temperature, and should be kept to "a red heat, or nearly so," that red heat, as I before said, considerably exceeding what is necessary for making of iron; and then he goes on to say, "But so high a temperature is not absolutely necessary to produce a beneficial effect. The air vessel or receptacle may be conveniently made of iron, but as the effect does not depend upon the nature of the material, other metals or convenient materials may be used. The size of the air vessel must depend upon the blast and on the heat necessary to be produced. For an ordinary smith's fire or forge, an air vessel or receptacle capable of containing 1,200 cubic inches will be of proper dimensions; and for a cupola of the usual size for cast-iron founders, an air vessel capable of containing 10,000 cubic inches will be of a proper size. For fires, forges, or furnaces upon a greater scale, such as blast furnaces for smelting iron and large cast-iron founders' cupolas, air vessels of proportionably increased dimensions and numbers are to be employed. The form or shape of the vessel or receptacle is immaterial to the effect, and may be adapted to the local circumstances or situation. The air vessels may generally be conveniently heated by a fire distinct from the fire to be affected by the blast or current of air, and generally it will be better that the air vessel and the fire by which it is heated should be inclosed in brickwork or masonry, through which the pipes or tubes connected with the air vessel should pass. The manner of applying the heat to the air vessel is, however, immaterial to the effect if it be kept at a proper temperature." What are those directions? They are applicable to an invention which creates the power and gives the means of influencing a vast variety of manufactures, many of those differing in every variety of circumstances. Here are general directions. The air receptacles or vessels are to be increased in number according as local circumstances may require; a very high temperature is essential, red heat is one that may be generally considered approved and useful, but not always necessary. Mr.

Neilson obtains this patent in 1828,—what do you hear of it? You hear by the witnesses who are called, that Mr. Neilson or his men are at various places erecting apparatus or inspecting apparatus. The first that is produced you are told is a vessel in this form (pointing to a model); here is a pipe or bottle made of iron. You observe, the fire is placed underneath, the flame plays through the bars, and so encircles the pipe or bottle, it being inclosed in brickwork or masonry. This is a model of the first form that was assumed. It is extremely probable that the temperature which would be obtained by this means might suit a vast variety of purposes to which forges and furnaces to be heated by the application of this blast might be applied. The first account that you have of it is, that it is used, I think, in some places in Scotland, and that two months after it had been in use, the workman returns and finds the owner of the foundry, for whose purpose this had been erected by Mr. Neilson, recasting himself for the same purpose in the same form. They had had the experience of two months; they knew how far it was applicable to the purpose of smelting iron. At the end of two months they recast the same form a little stronger; that continues at work, the man tells you, for twelve months. The principle of this patent is, that you are to have the atmospheric air confined in a vessel exposed to the action of fire, and that atmospheric air, thus inclosed, thus heated, blown into the furnace. What is there to control the shape of this vessel? You want a greater quantity of heat than a vessel of given dimensions will afford you. What do you do? You may extend its length, or you may have two instead of one, if you please, or you may have ten instead of one or two. Is there any difference in the principle? Not the least in the world. The principle is the exposure of this vessel charged with atmospheric air to the action of the fire, and then having it blasted into the furnace. What does it matter to the principle whether there are one, two, three, eight, or ten? They are all pressed out from the same orifice, there is nothing more in one than the exposure of the vessel to the action of the fire so as to get the atmospheric air to the required temperature, whether it is one, or two, or three, is perfectly immaterial. The higher the temperature you require, the longer you must keep

the atmospheric air exposed to the action of the fire. If it passes through a straight pipe, it will onlybe exposed to the heat a certain portion of time; if it is not quite long enough you may bend the pipe to give it length. Well, then, inasmuch as the air passes through the vessel, that portion of it which comes in contact with the iron sides will of course be more exposed to the action of the heat than that which is in the interior of the stream. The middle of the volume of air not coming in contact with the sides of the vessel will not be so heated as the surface, which is immediately in contact with the sides of the heated vessel. One object, therefore, will be, if you want a temperature higher, so to conduct the air through, as to bring the largest possible portion in contact with the heated surface of the vessel. Do men of science doubt if they want to give additional heat to the air how it is to be done? Is there any magic in the idea, that if you want the heat of the air increased, you will expose that air longer to the action of the heated surface or the fire? None at all; everybody says no, none at all. If, therefore, you wish to retain the air for a longer period of time, instead of having this (pointing to the bottle-shaped model), you put it into the pipe, it may be one, two, or three; and you observe that which is erected by Mr. Neilson, which is the subject of the license, which is paid for per ton,—the air, as you observe, enters, as it may be here (referring to Mr. Crane's model-pipes), it passes through two or three of these, then it is expelled into the chamber; it re-enters another, passes through three more, and so three and three, or six and six, no matter which, until having been kept a certain portion of time, for no other purpose than to make it travel through and be exposed to these heated surfaces, and to change the exterior surface, which will come in contact with this, it passes out. What is that but in effect just lengthening these pipes, only that instead of lengthening you bend them? Extend this a sufficient length, and you will have the whole effect; so that it is to be a pipe to be shortened, to be only of a given length, and you are not to have sense enough if it is not long enough to add a little to it. It is nothing more than producing a certain length of pipe—that length would be as easily obtained by lengthening it longitudinally as by dividing it in

the manner you have seen; that is the whole object of it. Is there any difference? Not the least in the world; and that is but in effect what it would be if you were to join each of those pipes together and extend them, putting certain stops in particular parts; that is the whole of it. And you understand that all this is inclosed in masonry or brickwork, the same as this is covered with brickwork. Here is the fire (pointing to the models) underneath, playing through these bars, and so is the fire underneath, this playing through these bars, exposed to its action round these pipes, and the whole inclosed, to prevent the escape of the heat, with masonry or brickwork. Is this Neilson's patent? My best witness is Mr. Crane; he had not got his apparatus until after he had got his patent, yet seeing and knowing the description of apparatus to be used, beyond all doubt seeing and knowing Mr. Neilson's patent, he knows he is right, he is perfectly satisfied that he has no pretence, even with Mr. Carpmael's assistance, of resisting it, and accordingly he gets Mr. Neilson to erect it himself, and come to the agreement with him which you have heard. I therefore say, are Mr. Crane's works conducted upon Mr. Neilson's plan? Here they are constructed by Mr. Neilson, and yet an attempt is made to persuade you that Mr. Crane, who knew nothing upon earth upon the subject, who had no knowledge or intelligence which he could bring to bear on the subject, you are told that Mr. Crane is acting under something quite independent of Mr. Neilson. Gentlemen, it only requires to be looked at and considered a moment, to be perceived, first of all, that the attempt on the part of Mr. Crane is nothing more than this,—a patent which is not professed to be limited to particular and specific purposes, but which is professed to be applicable to all purposes, which can have no other object than to operate on a different species of fuel with which those furnaces may be fed. Mr. Crane says, "I will take out a patent for applying Mr. Neilson's patent to one particular article of fuel." Is Mr. Neilson's patent limited to one particular description of fuel? If, as I before said, you could get a patent screw, would it be limited to one particular article to which to apply it? Certainly not. The most valuable patents are those which are of general application, which give you the

means of bringing other powers and other materials into useful action. No patentee ever yet was thought to be subject to this, that as the knowledge of his patent extended, that as its use and advantage to the public became more obvious, his interests were to be limited; and that every man who found out that the patent could be used for this or that purpose, had a right himself to interrupt the patentee and to take out a patent.

The first question to which I call your attention is to show you Mr. Crane has, in truth, done nothing upon earth but apply Mr. Neilson's patent to known articles by known means to effect a known object. Stone coal had been applied more or less to the manufacture of iron; attention was drawn to it, which so applied, there was no other distinction whatever between the mode of manufacturing the iron with that sort of coal and with any other sort of coal. The object was to manufacture the iron; the means were by various coal, some of one description, and some of another, the stone coal among the rest, so that you will observe, that the thing to be made was a thing perfectly well known before, the materials with which it was to be made were perfectly well known before. Now comes the means by which those materials are to be brought into action, and that is the hot blast of Mr. Neilson; so that there being notoriously a patent for hot blast, Mr. Crane applied the well-known hot blast to the well-known materials for making iron, and that is all he does.

Now the question is, whether, in point of law or fact, such a patent can exist. I say it cannot; and my first object has been to present to your consideration the circumstances under which Mr. Crane has set about to establish this claim. And I beg of you to remember, that in a case where so much merit is claimed and where with so much merit being claimed, the whole success of the case must depend upon, to a considerable extent, if not altogether, defeating an admitted valuable patent—I say, it is extremely material that in such a case you should bear in mind those parts to which I have called your attention; and that in point of fact, the persons claiming the merit have been obliged to call in the original patentee in order to carry his own patent into effect. And who is he bringing this action against? The defendants are iron-masters, possessing a valuable

property, composed to a considerable extent of this stone coal. Attempts have been made, much beyond what fairness warrants of ascribing, even in this valuable discovery of the hot blast, and of its application so generally to the purposes of fuel in the manufacturing of iron, attempts have been made very much to extend its consequences. It turns out that new establishments have been created in the iron trade, quite independently of the use of stone coal, where bituminous coal is used. It also turns out that anthracite or stone coal has become an article of great and most extensive export. But all the increased value which has lately attached to the property, all the new establishments which are erected, are to be ascribed to the consumption of stone coal in making iron—there is no foundation for that. That for a certain description of iron to be used for certain purposes, the application of stone coal is valuable, there is not a shadow of doubt; my clients are as glad to know it as anybody; they are manufacturers of iron, and they occasionally manufacture it from stone coal, as you have heard. A person came over to their manufactory from the plaintiff, to see what they were doing; upon which, you will observe, he is invited to the furnace, he is permitted to see everything; and they said, "There, you may go about and inform yourself;" not the least impediment, not the least secrecy; but this action is brought by their neighbour, Mr. Crane, against them, because, forsooth, they, in common with him, seek to benefit by Mr. Neilson's patent of the hot blast, using their own stone, using their own material in the old-fashioned way. "But no," says Mr. Crane, "I have a monopoly of Mr. Neilson's patent as applicable to stone coal, because I made such haste that I got my patent before I knew the least in the world upon the subject, before I had made any experiments, before I had melted an ounce, or knew whether it would or not." Under those circumstances the action is brought.

Now, Gentlemen, first of all, it is said that Mr. Crane is the inventor of a new manufacture. What does he mean by "a new manufacture?" Making iron in the same way that it was made before, and merely borrowing the application of another man's patent plan—is that being the inventor of a new manufacture? The description of coal used, no doubt, operates on the quality

of the iron, for it appears that iron, notwithstanding the roughness of the material, is one of the most delicate manufactures in which you can be engaged; for it appears that the same furnace will vary, nobody can tell why or wherefore; it will to-day produce very good iron; it will to-morrow, from materials which are supposed to be identical almost,—the furnace charged in the same way, conducted by the same men, materials from the same heap,—will produce iron of a very different description, and nobody can tell why or wherefore. One week the furnace will work well and kindly, and produce good iron, the next week it will be perverse and unkind, and produce very bad iron, so that according to this, every variety of iron which may be produced in consequence of the use of a different kind of coal is a new manufacture. You hear there are a thousand of these apparently causeless varieties in the quality of the article produced, which no doubt must be something or other in the fuel, the precise nature of which has not yet been disclosed. If you will recollect, in the Abbercarne works, which we are told have failed, there was one very awkward circumstance, which, under the particular state of the times, appears to me very likely to have produced something in the atmosphere to lead to such a consequence; iron was very low; if the Abbercarne works succeeded in making good iron from stone coal and the cold blast, there was a certain sum of 300*l.* a-year to be paid; but iron was so low, and the quantity made or required was so small, that it would not pay to make it. I do not wonder it would not pay, so as to bring the charge of 300*l.* a-year on the proprietors, but it failed. You observe there was a small furnace, which the witnesses have described as an ordinary furnace, though a small one, that did succeed, whereupon they were induced to build a larger one; that larger one did not succeed; somehow or other it did succeed up to the time it was sold, but when it came into the hands of the British Iron Company something or other occurred, and that which had succeeded up to the time of their purchase failed. You would suppose in a large establishment, with a splendid title like that which you have heard,—you would suppose that there were some intelligent persons who when they saw that furnace at work and were about to purchase the works, would have paid some

attention to ascertain whether those works were performing their destined office with effect, yet they buy it while it is in work; it is continued in work for some short time, it is then discontinued, and the proprietor gets no 300*l.* a-year; and the price of iron, I am very sorry to say, is not such now as to give any great encouragement to embark in a speculation which may bring with it the payment of 300*l.* a-year. But you may observe, that the stone coal succeeded in the small furnace there. Now the large one, I think, if I recollect right, is open to some remark; I think that is the one that was worked with wooden cylinders, that is described as having been so bad and so imperfect in its operations, that the surprise would rather have been that it succeeded than that it failed. Mr. Northall's evidence is addressed to that. I am told that he said he did not think it would succeed even with coke. So that you observe, that a place purchased expressly with a view of making iron from the cold blast and from stone coal—succeeds for a time; it fails, having a most imperfect apparatus; when, to give effect to any new attempt of this sort it ought to have had every chance given to it by the most perfect apparatus, yet it failed; but you find it succeeded even under the old apparatus with the best materials.

Now, Gentlemen, calling your attention to who is the plaintiff, and what are the circumstances in which he stands, working by a license from Mr. Neilson, getting his patent before he had the apparatus in existence, not showing you he possessed the slightest knowledge on the subject, or that he had made even any inquiry upon it, brings his action against somebody else, because, in common with himself, that somebody also has applied a known invention to known given public purposes. What is the ground of this?

The Lord Chief Justice.—Is it anything but a question of law at last?

The Solicitor-General.—I think not.

The Lord Chief Justice.—I think it is not. I have been listening with great attention to it; it must come at last to, what is the meaning of the word "manufacture," under the Statute, whether the application of a known and patented mode of working the blast to a special purpose, is a manufacture? and when you come to the other point, whether he is the first and true in-

ventor of it? Then it is again a question of law, whether the applying this knowledge, which is part at least of the invention—and a very important one--applying it to that which is also known, though not as it appears to me previously combined with it, makes him or not the first or true inventor. I do not see anything to leave to the jury.

The Solicitor-General.—I thought your Lordship would have a difficulty. The only part I wish to call your attention to is in regard to the fifth plea.

The Lord Chief Justice.—I thought that was a separate one; but you involve in that the same considerations.

The Solicitor-General.—I have not the least objection to the Court drawing any inference which can properly be drawn.

The Lord Chief Justice.—I think it will be the better course to hear it in the common way; *pro forma*, a verdict here, and then, under a special case, on the facts which are on my notes.

The Solicitor-General.—In any way that your Lordship pleases.

The Lord Chief Justice.—Moving on my notes.

The Solicitor-General.—I would move to enter a nonsuit, and if the Court should think fit, turn it into a special case or a special verdict. I have no wish for a special verdict.

The Lord Chief Justice.—There is a great deal of nicety in it.

Sir F. Pollock.—I think my Friend's entering a nonsuit is contrary—

The Solicitor-General.—I will do that which is most suitable to the case.

Sir F. Pollock.—I would rather leave it to the Court to dispose of it altogether.

The Lord Chief Justice.—To say whether it shall be the one or the other?

Sir F. Pollock.—Yes.

The Solicitor-General.—That I have no objection to.

The Lord Chief Justice.—I think we have been beating about it from first to last; it is a mere question which might be raised upon a demurrer.

The Solicitor-General.—I thought your Lordship would intimate to me when you had arrived at that conclusion, otherwise I should have applied to you at the close of the

case on the part of the plaintiff; but there is always an inconvenience, I think, until one knows what course the Judge will take.

The Lord Chief Justice.—Then let it be so. A verdict for the plaintiff for one shilling, subject to a motion on your part, either for a nonsuit or special case or verdict.

The Solicitor-General.—Yes, my Lord; the Court is to draw any inference, of course.

The Lord Chief Justice.—O, yes.

Sir F. Pollock.—It is our special jury, my Lord.

The Lord Chief Justice.—It is a proper case, certainly, for a special jury.

Sir F. Pollock.—I don't know whether your Lordship would reserve the power to certify with respect to the merits of the invention.

The Lord Chief Justice.—That is under the Act.

Mr. Sergeant Bompas.—We generally take the rule that the Court shall have the same power as at *Nisi Prius.*

The Lord Chief Justice.—Reserve the same power.

Verdict accordingly,—One Shilling damages.

CRANE *v.* PRICE AND OTHERS.

Before the Lord Chief Justice (Sir N. Tindal), Mr. Justice Erskine, Mr. Justice Coltman, and Mr. Justice Maule.—Jan. 17, 22, and 27, 1842.

A Rule was obtained according to the leave reserved, and it was directed by the Court that the case should be argued as a special case, and that the printed short-hand notes of the evidence should be taken as if they were the notes of his Lordship at the trial.

The Attorney-General (Sir F. Pollock), Mr. R. V. Richards, Mr. Montague Smith, and *Mr. Webster* appeared for the plaintiff.

Mr. Sergeant Bompas and *Mr. Rotch* appeared for the defendants.

After the argument, which occupied three days, the Court took time to consider, and the following is the written judgment of the Court, as delivered by *The Lord Chief Justice*:—

This was an action on the case for the infringement of a patent, granted to the plaintiff on the 28th September, 1836, for an improvement in the manufacture of iron. The declaration was in the usual form, and the defendants pleaded thereto, first, that they were not guilty; secondly, that the plaintiff was not the first and true inventor of the said improvement. Upon each of which pleas issue was joined. Thirdly, after setting out at length the plaintiff's specification, the defendants pleaded, that the alleged improvement therein described, was not a new manufacture, invented by the plaintiff, within the intent and meaning of the Statute, as to the public use and exercise thereof in England, which allegation was traversed by the plaintiff in his replication. Fourthly, the defendants pleaded, that the nature of the plaintiff's invention, and the manner in which it was to be performed, was not particularly described or ascertained by the plaintiff in his specification; upon which plea issue was joined. And in their last plea the defendants, after referring to the plaintiff's specification before set out in the third plea, stated the grant of letters patent, dated the 11th of September, 1828, to one James Beaumont Neilson, for an improved application of air to produce heat in fires, forges, and furnaces, where bellows or other blowing apparatus were required; that Neilson's invention was the production and application of a hot air blast, and was in public use, with Neilson's license, in the smelting and manufacturing of iron from iron-stone, and was the hot-air blast in the plaintiff's specification mentioned; that the plaintiff could not use the hot-air blast mentioned in his specification without Neilson's license; and that he had obtained such license before the grant of his letters patent; and that the using by the plaintiff of the hot-air blast in the smelting of iron from iron-stone, combined with anthracite or stone-coal, as mentioned in his specification, was a using and imitating of Neilson's invention, whereby the plaintiff's patent was void. The plaintiff replied to this last plea, that Neilson's invention was not the same hot-air blast; and that the machinery and apparatus adopted for the application thereof, mentioned and referred to in the plaintiff's specification, was not, nor was the using by the plaintiff of the invention as described in his specification a using and imitating of Neilson's invention;

described in Neilson's specification: which allegation is traversed by the defendants in their rejoinder.

At the trial before me, the verdict was entered for the plaintiff on all the issues, subject to the opinion of the Court upon the evidence given at the trial, as contained in a report agreed upon between the parties, the Court being at liberty to draw the same inference from it as a jury might draw.

On the argument, it was contended by the defendants, that the verdict ought to be entered for them on each of the issues joined on the record; but as the main question between the parties turns on the third issue, which involves the question, whether the invention of the plaintiff is a manufacture within the intent and meaning of the Statute of James; that is, whether it is or is not the subject-matter of a patent; and as the determination of this issue in favour of the one party or the other, will render the decision of the other issues free from difficulty, the simplest way will be, to apply ourselves in the first instance to that question.

Now, in order to determine whether the improvement described in the patent is or is not a manufacture within the Statute, we must in the first place ascertain precisely what is the inventior claimed by the plaintiff; and then by the application of some principles admitted and acknowledged in the application of the law relating to patents, and by the authority of decided cases, determine the question in dispute between the parties. The plaintiff describes the object of his invention to be, the application of anthracite or stone coal combined with hot-air blast, in the smelting or manufacture of iron from ironstone, mine, or ore, and states distinctly and unequivocally, at the end of his specification, that he does not claim the use of a hot-air blast separately as of his invention, when uncombined with the application of anthracite or stone coal. Nor does he claim the application of anthracite or stone-coal when uncombined with the using of hot-air blast; but what he claims as his invention is, the application of anthracite or stone-coal and culm, combined with the using of hot-air blast, in the smelting and manufacture of iron from iron-stone, mine, or ore. And the question, therefore, becomes this—whether, admitting the use of the hot-air blast to have been known before in the manufacture of iron with bituminous

coal, and the use of anthracite, or stone-coal, to have been known before in the manufacture of iron with cold blast, but that the combination of the two together (the hot blast and the anthracite) were not known to be combined before in the manufacture of iron, whether such combination can be the subject of a patent.

We are of opinion, that if the result produced by such a combination is either a new article, or a better article, or a cheaper article to the public, than that produced before by the old method, that such combination is an invention or manufacture intended by the Statute, and may well become the subject of a patent. Such an assumed state of facts falls clearly within the principle exemplified by *Chief Justice Abbott*,* where he is determining what is or what is not the subject of a patent, namely, it may, perhaps, extend to a new process to be carried on by known implements or elements acting upon known substances, and ultimately producing some other known substance, but producing it in a cheaper or more expeditious manner, or a better or more useful kind. And it falls also within the doctrine laid down by *Lord Eldon*,† that there may be a valid patent for a known combination of materials previously in use, for the same purpose, or even for a new method of applying such materials. But the specification must clearly express, that it is in respect of such new combination or application.

There are numerous instances of patents which have been granted, where the invention consisted in no more than in the use of things already known, and acting with them in a manner already known, and producing effects already known, but producing those effects so as to be more economically or beneficially enjoyed by the public. It will be sufficient to refer to a few instances, some of which patents have failed on other grounds, but none on the ground that the invention itself was not the subject of a patent.

We may first instance Hall's patent, for applying the flame of gas to singe off the superfluous fibres of lace; where a flame of oil had been used before for that same purpose.‡ Derosne's patent, in which the invention con-

* *The King* v. *Wheeler*, vol. i. p. 394.
† *Hill* v. *Thompson, et al.*, vol. i. p. 369.
‡ *Hall* v. *Boot*, vol. i. p. 423.

THE

REPERTORY

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PATENT INVENTIONS.

No. 6. Vol. XVII. ENLARGED SERIES.—JUNE, 1851.

Specification of the Patent granted to Henry Bessemer, *of Baxter House, Old Saint Pancras-road, in the County of Middlesex, Engineer, for Certain Improvements in Apparatus for acting by Centrifugal Force in the Manufacture of Sugar, and other Improvements in the Treatment of Saccharine Matter by such Apparatus.*—Sealed July 31, 1850.

(*Continued from* p. 309.)

Fig. 2, a vertical section; and

Figs. 3 and 4, details of some parts not sufficiently delineated in fig. 2 to be readily understood. The outer case, A, of the machine is made with an enlarged annular space, A^1, extending around its upper edge, for the reception of the cured sugar as it is thrown off from the drum by centrifugal force. The lower part of the external case is provided with a semicircular channel, A^2, extending around it, for the purpose of receiving the fluid from the sugar under operation. Around the centre of the lower part of the case there is a conical chamber, A^3, in which a piece of iron, B, is placed. This piece of iron is of a circular form, having a

boss, B[1], in the centre, and a groove or sunk channel around its outer edge, in which is inserted a ring of vulcanized india-rubber, I, the outer part of which is made conical, so as to fit the conical recess or chamber, A[3]. In the boss, B[1], there are three pieces of brass, G, which form a bearing for the lower part of the main shaft, D, of the machine. These brass pieces are keyed up tight, by wedges, E, (see fig. 4,) where these parts are shown in plan. Beneath the shaft is a flat and polished piece of hardened steel, F, on which the rounded end of the main shaft rests. Oil is supplied to this surface through holes, G, in the iron piece, B[1], so that the whole of the lower space, H, may be filled with oil for the lubrication of the sides and bottom of the axis. By this arrangement, any inequality of load which tends to bend the main shaft will be enabled to move the lower part of the shaft through a small space, by compressing the ring of vulcanized india-rubber, and sliding the rounded end of the shaft over the plain steel surface on which it rests, the elasticity of the india-rubber having always a tendency to return the shaft to its proper central position. The upper part of the main shaft, D, works in a leather bush, which may be tightened up from time to time by a gland, J, in a manner hereinbefore described, the gland, J, being screwed into a hollow piece of cast-iron, K, which is provided with a flange, K[1], by which it is bolted to the ceiling or beams overhead. It has holes, K[2], on four sides for the purpose of getting at the gland, J, to tighten it, and for the purpose of supplying oil. Below the leather bush is a cup, L, fastened on the shaft, D,—it has a contracted mouth for the purpose of allowing it to retain any oil that it may receive from the bearing above, and it serves as the driving drum to the shaft, D. On the shaft, D, there is keyed the centrifugal drum, M, having a conical support, M[1], projecting downwards, and another conical support, M[2], standing upwards, and fastened to the shaft by having a boss inserted in it, which closely embraces the shaft. At a small distance above the bottom of the drum, M, is placed a sort of false bottom, M[3], which rises up in the form of a hollow truncated cone at M[4], leaving an annular space between it and the cone, M[2]. At the outer edge of the piece forming the false bottom, is a flange or ring, M[5], projecting vertically upwards, parallel with the interior surface of the cylindrical part of the drum, M, and leaving an annular space between them of two or three inches. The false bottom, M[4], is kept in its posi-

tion by vertical radial partitions, N, best seen at fig. 3, which represents a plan of the underside of the false bottom with the radial partitions projecting from it. The upper edge of the drum, M, has its flange outward, and projecting over the space between the drum and the outer case. If we suppose that machine to have been in operation, and a thick crust or wall of sugar, S, lining the interior of the drum, and the space below the false bottom to be unoccupied, then we shall have the general condition of the machine. The perforations of the drum do not extend quite so low down as the false bottom, therefore in that part of the space, S[1], the matters under operation still maintain their semi-fluid condition, and therefore freely rise in the passage between the parts, M and M[5]. Now, if any semi-fluid matter is let into the central annular space, from the pipe, P, the centrifugal action will immediately impel it against the semi-fluid mass already occupying the space, S[1], which will be displaced thereby, elevating the crust or wall of sugar, adhering round the inside of the drum. The new portions, as they rise upwards, will lose their fluid constituents, and in turn offer a resistance to the new portions of fluid let into the machine by the pipe, P. The rate at which the crust of sugar rises is thus made entirely to depend on the speed with which the fluid enters by the pipe, P, so that its action admits of the nicest regulation. When the crust of sugar rises above the top of the drum, M, it is thrown off by centrifugal force, and received into the large annular space, A[1], from which a boy can scrape it through a spout, Q, into the hogshead, R. The liquoring or washing of the crystallized mass, may be performed by admitting the required fluid by the pipe, T, which is perforated on the side nearest the sugar. The liquor will be separated from the rest of fluid matter thrown off by the circular gutter, U, which receives it, and from which a pipe may lead it away, and thus the operation of curing sugar by centrifugal force may be carried on continuously, as long as the machine is kept going, and the raw material supplied thereto. The extremely rapid rate at which centrifugal machines require to be driven has hitherto been a source of much difficulty in their use. The wear is sometimes excessive, and the high temperature of the sugar-house is unfavourable for leather straps, and the great distance at which they are sometimes required to be worked from the steam-engine, renders the cost of intermediate gearing very great for the amount of power transmitted. I,

therefore, apply the action of steam direct to the machine, and avoid loss of power, and original cost of the gearing required for transferring this power from a distant part of the establishment. This method is peculiarly applicable to sugar refineries, where steam pipes already traverse every floor of the building. One of the modes of carrying out this part of my invention is represented on sheet C, of the annexed drawings, where fig. 9 is a vertical section, and fig. 10 is a horizontal section on the line A, B, of fig. 9. The outer case, A, of this machine is made sufficiently large to contain two centrifugal drums, B and C, each of which has a separate basin, A^1, to receive the liquid thrown off from the drums. The central part of each basin rises up and forms a boss, which is bushed, and receives the upper part of the shafts, D, on which the centrifugal drums are bolted to a flange on the end of each shaft. At the lower part of the outer case there is a cross piece, A^3, cast with it, and extending the whole length of the frame, and a similar piece, A^4, joins it at right angles. Over this point of junction is fixed a brass step, E, in which a vertical crank shaft, F, revolves, its upper end being supported in brasses at G. The crank shaft carries a fly-wheel, H, turned truly on its edge, and in contact with it are two small drums, I, I, covered with leather; the drums are keyed upon the shafts, D, and give motion to the centrifugal drums, B and C. The lower part of the shafts, D, works in brass steps, K, which are free to slide in a box, L, in the direction of the fly-wheel. The spring, N, is pressed against one side of the step, K, the force of which spring may be increased or diminished by the regulating screws, P, whereby the leather-covered drums may be made to press at all times with as much force as will be sufficient to ensure their being driven by the fly-wheel. Opposite the crank, F^1, there is an opening, Q, in the outer case, through which the piston-rod of a small oscillating steam cylinder is made to pass, and is connected to the crank throw, F^1, the trunnions of the cylinder may work in brackets bolted to the outside of the case. But a still more simple mode of causing the power of steam to act directly in producing motion in centrifugal machines for manufacturing sugar, consists in attaching a pair of emissive arms to the vertical axis of these machines, whereby the same revolving shaft which forms the axis of the emissive engine, is also used for the axis of the centrifugal drum, reducing the entire machine to one revolving piece; and be

it remarked, that although the emissive steam-engine is very wasteful of power when applied through the agency of straps and drums to machinery requiring a slow motion, it is much less so when applied where high velocities are required, but when applied direct on the same axis as the drum of the centrifugal machine a great saving of its usual amount of friction is obtained. And it will be found in some cases more economical in power than the application of ordinary steam-engines acting at a high velocity, at a great distance from the source of power.

On sheet B, of the annexed drawings, I have represented one of these centrifugal machines driven by the emissive engine. Fig. 12, is an elevation, and fig. 13, a vertical section. The outer case, *a*, is divided into two separate chambers, a^1 and a^2. The lower chamber has within it the vertical shaft, *b*, on the lower end of which are fixed the emissive arms, *c*, *c*, which have their ends bent in opposite directions at right angles, so as to emit the jet of steam in opposite directions. In the bottom of the outer case, *a*, there is inserted a bell-metal step, *d*, hollowed out, so as to fit accurately the hemispherical end, *e*, of the shaft, *b*, which has a hole bored on the centre of it, communicating with the cross arms, *c*. The lower part of the step has a screw cut upon it, by which a steam-pipe is connected, and a communication established between the steam-boiler and the open ends of the arms, *c*, *c*. The steam emitted from them is received in the lower compartment, a^2, of the casing, and is to be allowed freely to escape therefrom, through a pipe, *e*, leading outside the building. The upper part of the step, *d*, is formed into an oil cup to lubricate the hemispherical bearing of the vertical shaft, *b*, which carries the centrifugal drum, *f*. The upper end of the shaft is shown passing through a brass bush in the centre of a piece of vulcanized india-rubber, *s*, which will prevent much of the jarring which would otherwise be produced by the inequality of the road in the drum, the hemispherical steam joint made use of at the foot of this shaft, admitting freely of such vibratory motion, without loss of steam. By the joint in this form of apparatus, there is the disadvantage of the large projecting moulding, a^3, made to give a longer range to the emissive arms. I therefore prefer to make an enlarged chamber for them to revolve in, as shown in figs. 15 and 16, sheet B, where *n* represents this chamber made with a flat upper surface, so

that it may be sunk into the floor, flush with the line, *h**, and may then be stood upon without difficulty, while the machine is being charged or uncharged. The only other peculiarity in this apparatus is the mode in which the jarring of the upper bearing is prevented when the machine is in rapid motion. For this purpose a small roller, *i*, is fitted freely on to the shaft, *j*, and supported on a collar, *k*, the central conical projection, *l**, of the outer case, *l*, is turned true at *n*, and of a size somewhat larger than the diameter of the roller, *i*, so that the shaft may incline to either side when at rest; but as the machine acquires a high velocity, it will acquire a vertical position, and produce very little vibratory motion; the other parts of this apparatus are similar to that last herein described, and therefore need not be more particularly described. It will be obvious that the mode of lifting off the drum to uncharge, and changing it for another, as hereinbefore described, may be applied to either of the machines represented in figs. 12, 13, 14, and 15, on sheet B, as there is no gearing from above to interfere with its removal.

Another mode of supplying steam to the revolving axis of centrifugal machines, impelled by emissive arms, is represented on sheet D, of the annexed drawings, fig. 5 being an elevation, and fig. 6 a vertical section of the apparatus. The shaft, *a*, of this machine has formed upon it a boss, *b*, into which the emissive arms, *c*, *c*, are fixed below the boss; the shaft is made tubular, and has several holes made in it at *d*, while the lower end is stopped up by a piece of steel, *e*, which forms the pivot on which it revolves in the bell-metal bush, *f*, the bottom of the casing in which the steam arms revolve has a projecting part, *g*, in the upper part of which there is a gland, *h*, and stuffing-box, *i*, to keep the shaft steam-tight; below the stuffing-box it is hollowed out, and forms a chamber, *l*, extending round the shaft at that part in which the holes, *d*, are made; on one side of this chamber the steam-pipe, *m*, is attached, the steam from which having free access to the chamber, *l*, will enter the holes, *d*, when the shaft is revolving, and find its escape at the bent ends of the arms, *c*, *c*, the reactionary force of which will put the machine in motion, after which it is allowed to escape by the pipe, *y*, into the open air. The upper end of the shaft passes through the brass bush, *p*, and has keyed upon it an iron frame, *n*, consisting of a central boss, *n*[1], and three equidistant arms, *n*[2], connected

to the boss, and diverging in a straight line therefrom; at the end of each of these arms is a boss, n^3, one of which is shown in section on the left side of the central shaft, and another boss, n^3, is shown in elevation on the right side; this one appears nearer the centre in consequence of its angular position, or foreshortening of it in the drawing; each of the three bosses, n^3, have a hemispherical cup formed in the upper side of them, and a conical aperture on the underside; into these cups are placed three suspension rods, *r*, *r*, on each of which there is formed three balls; the upper ones, r^1, are fitted to three blocks, *s*, which are rivetted to the central part of the centrifugal drum, *z*; these blocks, *s*, have hemispherical cavities on their underside, and rest on the top balls, r^1, of the suspension rods; the largest balls, r^2, on the suspension rods rest in the hemispherical cavity formed in the bosses, n^3, while the suspension rods pass further downwards through the conical openings in the bosses, and support the heavy iron ring, *t*; this ring has three hemispherical cavities formed on its underside, and three conical holes leading into them from the upper side; the rods, *r*, pass through the conical holes, and have the balls, r^3, put upon their lower ends, where they are secured by a nut and screw at *u*; it will thus be evident that if the drum, *z*, be pushed in any direction horizontally, that the three suspension rods, *r*, will deviate from their vertical position, moving on the central ball joints, r^2; but by this motion of the drum, *z*, the iron ring, *t*, will be projected in a horizontal position from the centre, in the precisely opposite direction to the movement of the drum, and as the suspension rods, *r*, are much longer below the point of suspension than they are above it, it follows that the ring of iron, *t*, will be projected to a much greater distance from the centre in one direction than the drum is on the other, the relative proportion of such distance being equal to the difference of the distance between the upper and lower balls from the point of suspension. Now the object of this arrangement is to compensate for the varying load carried by the drum, which becomes heavier or lighter on each side of the drum, as the fluid parts make their escape with greater or less facility; and instead of the heavy side carrying over the drum and generating a violent oscillating motion, as it would do if keyed upon it, the drum in this case is at liberty to go over a little to either side, without carrying the shaft with it; but in so going over, the heavy

iron ring, *t*, will be projected to a greater distance in the opposite direction, whereby the equilibrium will be restored, and the drum will revolve on its centre of gravity quietly enough, without being disturbed by the nominal axis of rotation, namely, the central shaft. In this machine, as in one of those hereinbefore described, the part containing the emissive arms is enlarged beyond the diameter of the drum case, *x*, and made flat, so that it may be let into the floor, and allow the workmen to walk over it when attending to the machine.

The drums of centrifugal machines, heretofore generally used, have been made of wire work, strapped and braced diagonally on the outside to give them the desired strength; but notwithstanding these numerous stays, the wire work is easily loosened, and soon requires repair, while the straps and braces on its exterior surface prevent that equal action on the sugar which is desired, those parts of the mass immediately behind the straps or stays being imperfectly cured, and of a darker colour than the rest of the mass, by reason of the obstruction caused by them to the free escape of the fluid; now the last part of my said improvements has for its object the removal of this defect, and the construction of a durable drum equally pervious at all parts of its surface. For this purpose I take a sheet of metal, and having formed it into a cylinder, I braze the two edges and draw it through ties, after the manner of drawing tubes; the interior is then cut into grooves by a circular cutter, these grooves extending half-way through the metal; they are formed in a line parallel to the axis of the cylinder. When this is done, I place the grooved cylinder on a mandril, and put it in a lathe, and then proceed to cut a series of concentric grooves around the cylinder; these last grooves being at right angles to those before made, and like them extending half-way through the metal, it follows that a series of square holes will be formed all over its surface, while a cross or lattice-work of metal will remain connected together at every crossing. A portion of such a surface as this is shown in figs. 8, 9, and 10, sheet D; the holes may thus be made fine enough to require no internal lining of wire gauze, or they may be made larger, and the drum be lined in the usual way; or, instead of this mode of grooving, a cylinder of metal may be prepared and drawn in like manner, and by a suitable apparatus the whole of its surface may be drilled with small holes, as shown in figs. 11 and

12, sheet D, all of which are to be conical, the smaller end being inwards, so that any grains of sugar that may enter these holes from within will not remain there, and obstruct the outflow of the fluid matters, but by reason of the increasing size of the holes they will readily pass out and leave a free passage at all times. These holes may be made small enough to require no inner lining to the drum, or they may be made larger and a lining be used as usual. In all cases where a lining of wire gauze is used in centrifugal drums, I pass it through a pair of rollers, such as is used for rolling sheet metal, whereby its surface is flattened, and it will not so easily retain the grains of sugar as it does if used in the state in which it is woven.

In order to remove such grains of sugar as may adhere to or become imbedded in interstices of the drum, I use a circular wire or other brush mounted on an axle in a small frame, as represented at fig. 13, sheet D; the frame, *a*, in which the brush, *b*, revolves, has pivots at *c*, *c*, which work in lugs fixed to the inside of the casing of the centrifugal machines; a slot should be made in the case to allow the handle, *d*, to project out, so that whenever it is found that the drum is clogged the handle may be pulled and the wire brush will be brought against the revolving surface, this will cause the brush to revolve also, and by the action of the drum the crystals of the sugar which have been forced into the interstices of it will be immediately displaced and the drum again made free. This operation is best performed when the drum is moving at a moderate rate.

Having now described my invention, and the various methods by which the same is to be carried into effect, I desire it to be understood that I have herein described many parts of machinery which in themselves are not new, and which I therefore do not claim as my invention; and that I do not confine myself to the precise modification or combination of parts herein shown, so long as the essential features of the various parts of my invention be retained.

But what I do claim as my invention is,

First, the apparatus shown at all the figures on sheet A, and at figs. 1, 2, 3, and 4, on sheet D, of the annexed drawings, for the purpose of separating the fragments of cellular tissue from cane juice, and the coagulated or other matters also from cane juice, but after the process of desiccation.

Secondly, I claim the centrifugal apparatus represented in figs. 7 and 8, sheet D, for the purpose of increasing the evaporation of saccharine fluids in the manner described.

Thirdly, I claim the apparatus shown in figs. 1, 2, 3, and 4, sheet D, for separating the coagulated and other matters from syrups in the refining of sugar.

Fourthly, I claim the mode represented in figs. 1 and 2, sheet B, of suspending the shafts and drums of centrifugal machines for curing sugar, and the methods of connecting such shafts with the first mover, as there represented, and the mode by which their orbicular motion is restrained within certain limits; and also the mode of suspending the drums of centrifugal machines on a universal ball-joint, as shown at figs. 5 and 6, sheet C.

Fifthly, I claim the use of elastic packing between the bottom of centrifugal machines and the floor on which they rest, for the purpose of lessening the amount of vibration transmitted to the buildings in which they are worked.

Sixthly, I claim in centrifugal machines for curing sugar the use of leather bushes to the spindles and vulcanized india-rubber rings surrounding the bushes in which the axle revolves, for the purpose of lessening the tremour and wear of such machines.

Seventhly, I claim the method represented in figs. 7 and 8, sheet C, of forming the axis of centrifugal machines of hollow cones of sheet-iron.

Eighthly, I claim the removing of the drum from the machine to be discharged of its contents, and immediately replacing it with another drum charged with fresh matter to be operated upon; and also the forming of the lower part of such drums with dishes, so as to retain within such dished or hollow part the materials previous to the rotatory motion being given to it.

Ninthly, I also claim the apparatus here shown for that purpose, in figs. 16, 17, 18, and 19, in sheet B.

Tenthly, I claim the discharging the sugar from centrifugal drums by the aid of centrifugal force only, as represented in figs. 1 and 2, sheet C.

Eleventhly, I claim the centrifugal machine and mode of driving the same, shown at figs. 9 and 10, sheet C.

Twelfthly, I claim fixing the centrifugal drums, used in the manufacture of sugar, on the axis of an emissive engine, as before described.

Thirteenthly, I claim the mode of supporting the drums of centrifugal machines on universal joints with a balancing ring, as shown in figs. 5 and 6, sheet D.

Fourteenthly, I claim the mode herein described of forming a perforated drum for centrifugal machines by grooving it internally and externally at right angles, in manner described; and also by perforating the drum with conical holes.

Lastly, I claim the mode herein described of keeping open the perforation of the drum by a wire or other suitable brush.—In witness, &c.

HENRY BESSEMER.

Enrolled January 31, 1851.

Specification of the Patent granted to JOHN BARSHAM, *of Chelmsford, in the County of Essex, Manufacturer, for Improvements in Separating the Fibres from Cocoa-nut Husks.*—Sealed April 26, 1849.

WITH AN ENGRAVING.

To all to whom these presents shall come, &c., &c.—My invention consists,

First, of the employment of crushing rollers for partially separating and for facilitating the complete separation of the fibres of cocoa-nut husks; and,

Secondly, my invention consists of employing apparatus having revolving surfaces with spikes or teeth, as hereafter explained, for separating the fibres of cocoa-nut husks. And in order that my invention may be most fully understood and readily carried into effect, I will proceed to describe the means pursued by me.

Description of the Drawings.

Fig. 1, is a section of a series of rollers used by me.

Fig. 2, is a front elevation of the same. The rollers are by preference grooved on their surfaces, and they are caused to be driven with different surface-speed, they being geared with cog-wheels of equal diameter, the rollers themselves being of different diameters, such arrangement producing very beneficial effects in working on cocoa-nut husks, the rollers acting to crush and drag the husks, and

thus partially to separate the fibres. The machine shown has two pairs of rollers, but this may be varied and other numbers used, though I believe the arrangement shown to be the best for carrying out this part of my invention. And I employ such rollers first in crushing the parts of the husks of cocoa-nuts when in a dry state, and then when in a wet or moist state. The pieces of the husks as they are removed from the nuts are each first to have the hard point or end which grows at the end of the husk cut off, which I do by chopping, and in this state I pass the pieces of the husks through between the rollers by placing them on the fixed table, *a*, and pressing them up to the rollers, which in their revolution take the pieces of husk and press or crush them, and at the same time drag the fibres by reason of the different surface-speed of the two rollers; then the second pair of rollers take the pieces of husk and repeat a similar process thereon.

I would remark that with hard husks this process requires to be repeated once or even twice; the pieces of husk are then put into water and allowed to remain therein for about two hours, or until they are thoroughly soaked, and they are then again passed between the rollers, they being set rather closer together, such passing of the pieces of husk in a moist state between the rollers being repeated several times in cases of hard husks.

I would state in respect to this part of my invention that I am aware that it has before been proposed to employ rollers with rough surfaces, but revolving in opposite directions, or so as to cause the pieces of husk to revolve on their own axes, for the purpose of rubbing out the matter connecting the fibres in the form of dust; I do not therefore claim rollers when so revolving in opposite directions.

The next operation to which the pieces of husk are subjected consists of causing the fibres to be submitted to a combing process, by acting with revolving combs or surfaces set with teeth.

Fig. 3, shows a plan of the machine I employ for this purpose; and,

Fig. 4, a transverse section of the machine, the two rollers or cylinders, *b*, *c*, are set with teeth by preference, such as is shown separately at fig. 5; but I do not confine myself to this form of tooth, and the teeth are set to about the inclination shown, and the rollers or cylinders move as indicated by the arrow in fig. 4. In the front of each of

the rollers, *b* and *c*, there is placed a rest, *d*, which is made capable of sliding to and from their rollers or cylinders, *b*, *c*. The workman holding a piece of a cocoa-nut husk, places one end on the top of the rest, *d*, and so that it will project over the same and incline downwards, and by his body or otherwise will gradually press forward the rest, *d*, and thus bring the end of the piece of cocoa-nut husk more and more in towards the cylinder, *b*, so as to remove the fine tuft of fibre which is on the interior of the stalk end of the piece of cocoa-nut husk. The piece of husk is then to be operated on by the next boy or workman by means of the cylinder, *e*, for which purpose he will hold it at one end till the fibres at that end are well combed out, and then he will turn the other end and cause the fibres to be well combed out, the middle portion being left partially uncombed, the piece of husk so held being caused to press on the rest, *d*, which is, as before stated, to be advanced as the process goes on, then the piece of husk is to be passed on to the next boy or workman to be operated on by the cylinder, *c*, which is covered with strong wire card, as shown separately, full size at fig. 6, by which the middle portion of the fibres will be completely separated, the boy or workman at this cylinder holding the ends of the fibres, so that the teeth of this cylinder may penetrate and comb out the middle portion of the fibres, and thus will the fibres be separated in a most complete and useful manner, the fibres remaining moist or wet through these combing out processes.

Having thus described the nature of my invention, and the manner in which the same is to be performed, I would have it understood that I do not confine myself to the details as herein described, so long as the peculiar character of either part of my invention be retained.

But what I claim is,

First, the partially separating the fibres of the husks of cocoa-nuts by passing pieces of the husks through rollers, both in the dry and wet state, as explained; and,

Secondly, I claim the combing out the fibres of the husks of cocoa-nuts by causing them to be acted on by rotatory combs when held.—In witness, &c.

JOHN BARSHAM.

Enrolled October 26, 1849.

Specification of the Patent granted to JOSEPH CHRISTIAN DAVIDSON, *of Yalding, in the County of Kent, Brickmaker, for Improvements in Lime and other Kilns and Furnaces.*—Sealed November 2, 1850.

WITH AN ENGRAVING.

To all to whom these presents shall come, &c., &c.—My invention consists,

First, of improvements in lime-kilns and furnaces; and,

Secondly, my invention consists of improvements in brick-kilns and furnaces for burning bricks, tiles, and such-like articles. And in order that my invention may be most fully understood and readily carried into effect, I will proceed to describe the means pursued by me.

Heretofore, in constructing lime-kilns and furnaces thereto, it has been usual to have the bed or bottom of the kiln with ash-pits below, and fire-bars over such ash-pits, and such ash-pits and fire-bars have heretofore usually passed from front to back of the kiln or nearly so, two such furnaces being usual to each kiln; and in burning limestone therein it has been the practice to make arches of the limestone over the furnace-bars, and under such arches the fires for burning the limestone have been lighted, all which is well understood, and it is also well known that the limestone in becoming heated breaks off, more or less depending partly on the care and skill and judgment of the lime-burner, the consequence of which is that the fires require to be often cleansed and such fallen pieces to be removed therefrom. Now, according to my invention, I cause lime-kilns to be constructed with complete beds or bottoms, and construct the furnaces away from the bed or bottom of the kiln.

The construction of a lime-kiln and the furnaces thereto may be varied, but the one shown by the drawings is such as is now used, constructed according to my invention.

Description of the Drawings.

Fig. 1, shows a vertical section of a lime-kiln and furnaces, taken in a direction from front to back.

Fig. 2, is another vertical section taken in a direction at right angles to the section shown at fig. 1; and,

Fig. 3, is a plan. The kiln is of the ordinary construc-

tion, except at the bed or bottom, which is made solid, and the furnaces are away from the bed of the kiln. *a, a,* is the bed or bottom of the kiln, there being no ash-pits formed therein, and consequently there are no fire-bars within the kiln; *b, b,* are the furnaces, which are away from the bed or bottom of the kiln, as shown.

In using lime-kilns and furnaces so constructed, arches are to be built of limestone on the bed of the kiln, as heretofore; but I find that they may be some inches lower than heretofore, when they were built over the furnaces, and the charging and closing of the kiln is to be as heretofore, the arches acting as reticulate flues, into which the flame and heat from the furnaces flow, and up through which the same pass amongst the charge of limestone above, thus burning the same. By these improvements, it will be found that the fires will only require to be cleansed from clinkers, there will be less fuel consumed, and the lime which falls from the arches, in place of becoming mixed with the fire, will be good lime, and form part of the useful product of the kiln. In constructing kilns and furnaces for burning bricks, tiles, and such-like articles, it has been usual to have numerous fire-places on each of two sides of a furnace, the fire-bars passing into the kilns. Now, according to my invention, I have the fire-places only on one side of such kilns, and, as in the lime-kilns above described, I have the furnaces away from the interior of the kiln; and I prefer to construct the furnaces some feet away from the kiln and exterior of the side wall thereof, so that the openings into the kiln through the side wall shall constitute the throats of the furnaces; and I make the back ends of the furnaces of such a kiln slightly below the level of the bed or bottom of the kiln, so that the flues made through the wall may slightly rise.

The distance at which the furnaces are built from the kiln may vary, depending on the convenience of the locality; but I prefer that the flue and throat leading from the end of the fire to the bed or bottom of the kiln should not be less than three to five feet, but they may be more. The furnaces I construct similar to those shown for the lime-kiln, but as they are to be more numerous, they will not require to be so long.

In burning bricks, tiles, and other like articles, I construct arches of bricks requiring to be burned, such arches being built reticulate (having numerous openings), by placing the bricks at distances apart, so as to admit the flame and

heat to pass freely in all directions, and such arches are built across the bed of the kiln, and the charge of bricks, tiles, or other articles, are then built into the kiln as heretofore.

Having thus described the nature of my invention, and the manner in which the same is to be performed, I would have it understood that I do not confine myself to the details as herein described.

But what I claim is,

First, the mode herein described of constructing lime-kilns and furnaces.

And, secondly, I claim the mode herein described of constructing kilns and furnaces for burning bricks, tiles, and other like articles.—In witness, &c.

JOSEPH CHRISTIAN DAVIDSON.

Enrolled May 2, 1851.

Specification of the Patent granted to J. FREDERICK R. ROBINSON, *of Boston, in the County of Suffolk, and State of Massachusetts, of the United States of America, for a New and Useful Sewing Machine.*—Sealed February 7, 1851.

WITH AN ENGRAVING.

To all to whom these presents shall come, &c., &c.—Of the said drawings, fig. 1 denotes a top view of my sewing machine; fig. 2, a side elevation of it; fig. 3, a front elevation of it; fig. 4, is a vertical section of the two thread guides; the pressers, the supporting plate, and the rotary cloth holder. Such other figures as may be necessary to a full and complete description of the invention will be hereinafter refered to and described.

The object of my invention is to produce either what is generally termed stitch and backstitch sewing, or ordinary stitching. By "ordinary stitch and backstitch" sewing, I mean that in which a thread, after being carried through a piece of cloth from its front to its rear side, is moved backwards the width of the stitch, is next again carried through from the rear side to the front side of the cloth, is next carried forwards laterally double the width of the stitch, or some other suitable distance greater than the width of the stitch, and is next passed through the cloth from its front

side to its rear side, such operation being successively repeated in the formation of the stitches.

By "ordinary stitching," I mean that in which a thread is passed through the cloth from its front side to its rear side, is next moved forwards the width of the stitch, is carried backwards through the cloth from its rear side to its front side, is next carried forwards the width of the stitch, and is again passed through the cloth from its front side to its rear side, and so on. This is frequently called the running or basting stitch.

Although the elements which constitute the combination of my machine may be adapted to the production of either of the above kinds of sewing, and this by slight changes in the mechanical contrivances by which the motions are produced and regulated; they may also be adapted, by proper changes, to the production of the ordinary cordwainer's stitch, which is produced by two threads, which cross one another every time they are passed through the cloth. It is to be understood, however, that the movements of such elements, in order to produce the cordwainer's stitch, must be effected and regulated by suitable mechanical contrivances applied to them, the application of such mechanical contrivances, as well as their selection or adoption, being the work of the mechanic who constructs the machine, and not, generally speaking, one of invention. In figs. 1 and 2, A, represents a circular base-plate table or stand, on which the operative parts of the machinery are supported by means of three, or any other suitable number of columns, B, C, D, raised vertically thereon; E, is the driving shaft, which carries a fly-wheel; F, has an eccentric, G, on one end, and a cam, H, on its other; the said shaft being put in motion by means of power applied to the crank, I, or in any other suitable manner. The eccentric operates in connexion with the surrounding band, K, and its connecting rod, L, to give a reciprocating or pendulous motion to the needle-frame, M, which is arranged as seen in the drawings, and is supported upon a horizontal shaft, N, that projects from the column or pillar, D, as seen in the drawings. The said needle-frame is composed of two bars, *a* and *b*, united together at their upper ends, and connected together at about one-third their entire length below their place of connexion by a circular curved bar or arc, O. The lower end of each of the legs, *a*, *b*, of such frame carries a curved needle, R or S, such needle being made to extend from the

inner side of the leg, as seen in the drawings. Each needle is constructed as represented in side view in fig. 5, on an enlarged scale, that is to say, it is provided with a long eye, *e*, which has a spring, *f*, fixed to one end of it, and forming a part of the needle, as seen in said fig. 5.

Each needle, during the movements of the needle-frame, passes through a slot, *i*, made through the flanch, *k*, which is erected vertically upon the base-plate, and which serves to support a circular hoop, P, which I denominate the cloth-holder, and which I shall hereinafter more particularly describe. The slot or passage, *i*, may be about a half an inch in its horizontal length, or it may be of a greater or less length, as circumstances may require. Its width, vertically, should be sufficient to receive each needle, and allow it to freely play through it. The said slot, on its front and rear sides, is provided with a flaring mouthpiece or presser, Q or U, which is formed in its vertical section, as seen in fig. 4. In its horizontal length the flaring mouthpiece should be about that of the slot. That mouthpiece which is on the rear or inner side of the flanch, which supports the cloth-holder, is fastened to the base-plate, whereas the one on the outer side of the flanch projects from an arm, *g*, which extends down from a frame, *h*, screwed to the post, D, by means of a screw, k^3. The front mouthpiece is made through a part of a projection, V, which is arranged in front of the flanch and cloth-holder, and is intended to prevent the cloth from being drawn off the points, *x*, *x*, *x*, of the cloth-holder during the operations of the outer needle, S, as well as those of the inner needle, R.

Fig. 6, represents a front view; and

Fig. 7, an end view of the projection, V, the same being drawn on an enlarged scale. In such figs. it will be seen that the said projection is provided with a passage-way, *r*, of a sufficient depth to receive the points of the cloth-holder, and to permit the free horizontal rotation of the whole series of them on their horizontal passage through the said contrivance. The arm, *g*, is hinged at its upper end to the frame, *h*, and in such manner as to enable it to be freely moved either towards or away from the cloth-holder, its distance from the cloth-holder being regulated by an adjusting screw, *r*, which is screwed horizontally through the lower end of an arm, v^1, which extends downwards from the frame, *h*, and so as to bring the adjusting screw directly in front of the arm, *g*.

Each mouthpiece should be so made as to cause the spring of the needle when it passes through the mouthpiece to close entirely downwards. The thread-guides which are seen at w, and x, are two bent bars of metal, arranged in the positions as seen in figs. 2 and 3. Both of these bars are adapted to the frame, *h*, in such manner as to be capable of being freely and separately moved, not only upwards and downwards, but in lateral directions, in planes which may be said to be at right angles to the plane of movement of the needle-frame.

Fig. 8, represents a front side view of the outer thread-guide, x, as it appears when detached from the rest of the machinery. Each of the said thread-guides is provided with a slot, *y*, through which a fulcrum pin, z, passes, the position of said pin being seen in figs. 2 and 3. Each of the said thread-guides has one end of a retracting spring, a^1, attached to it, as seen in figs. 2 and 3, the other or upper end of the said retracting spring being fastened to the frame, *h*, such spring being so arranged and made to operate as to lift the thread-guide upwards when necessary. The upper arm or part of one of the thread-guides is arranged on one side of the curved arc, o, while the upper arm or part of the other thread-guide is disposed on the opposite side of the said arc, both thread-guides being connected at their upper ends by a helical spring, b^1, which draws said ends towards one another. The lower end of each thread-guide is forked, the prongs or sides, c^1, d^1, of such fork being springs, and made respectively to contain two vertical friction rollers, e^1, f^1, see figs. 9 and 10 respectively, vertical and horizontal sections of the lower end of the thread-guide, and exhibiting the thread-plates, g^1, h^1, which are fastened to one of the springs, d^1, and project by the other, c^1. Each of the said thread-plates has a hole, i^1, made through it, for the passage of the needle, which passes through the plates and between the vertical friction rollers.

As soon as either needle enters the cloth, that thread-guide through which said needle does not pass or extend should have a lateral motion imparted to it, far enough to carry it out of the way of the point of the needle. Such lateral motion is given to it by means of one of two cams, k^1 or k^2, arranged upon the side of the arch, o, as seen in figs. 11, 12, and 13.

Fig. 11, being a top view of such arch; and

Figs. 12 and 13, being respectively views of its opposite

sides. The lateral movement aforesaid of the thread-guide being completed, the said thread-guide should immediately have a slight downward movement imparted to it, which movement is effected by a cam, l^1, or l^2, arranged upon the arch, as seen in figs. 11, 12, and 13, the cams, k^1, k^2, l^1, l^2, being made to work against suitable shoulders or bearing faces formed upon the upper arms of the thread-guides.

Fig. 14, represents an underside view of the arch, o; while fig. 15, is a cross section of it, showing the formation of the upper arms of the thread-guides, and their application to the arch, o. On each side of the arch there is a small cam, m^1, or m^2, arranged as seen in figs. 12, 13, and 14. The lower side of the arch between these two cams being a circular arch, such as will produce no vertical motion of either thread-guide while it is moving in contact with it. To each cam, m^1, or m^2, is applied a continuation, o^1, o^2, of the circular arch or portion between the said cams, m^1 or m^2. This continuation operating to produce no vertical movement of one thread-guide during such time as the other thread-guide is depressed a short distance by the cam, m^1 or m^2, which is immediately annexed to it.

We will now suppose one of the thread-guides moved downwards into its lowest position, or that in which it should be, to allow the passage of its needle through it. As soon as the needle commences to enter the thread-guide, the cam, m^1, or m^2, connected with the arm of the other thread-guide moves by such arm, so as to allow the retractive spring of the thread-guides to which said arm belongs to elevate the thread-guide, so as to carry the thread which extends through said thread-guide above the path of the needle, so that when the thread-guide is next moved laterally, the needle may pass directly under that part of the thread which is between the thread-guide and the cloth. Next such lateral movement of the thread-guide takes place sufficient to carry said portion of the thread laterally across and over the path of the needle. This having been accomplished by the action of one of the cams, which produce the lateral movements as before described. Next the thread-guide is depressed a short distance by one of the cams, l^1, l^2, and so as to fairly lay the thread upon the needle and behind the rear end of the spring, *f*, thereof, and so as to cause the thread, on the retraction or return movement of the needle, to be drawn under the spring and into the eye of the needle, and through the cloth by the needle.

By inspection of the drawings it will be seen that during each back movement of the needle through the cloth the spring of the needle is closed down by one of the mouth-pieces or pressers immediately before the said spring is drawn back through the cloth. The mouth-piece or presser becomes necessary when the needle is formed with a spring, but when said needle is made, as represented on an enlarged scale, in figs. 16 and 17, the former being a top view of the needle, and the latter a side view of it, such mouth-piece or presser is not essential to the operation of such needle. The needle, as exhibited in the two last-named figures, is formed with a round or elongated eye extending through it, which eye has a diagonal passage way made into it, as seen in top view, in fig. 16.

In sewing with this machine we do not make use of a continuous thread unwound from a bobbin, as do those machines which produce a chain-stitch, but we make use of a short piece of thread, such as a person uses when sewing by hand, with an ordinary sewing needle, and on commencing to sew we simply pass one end of the thread between a spring, *r*', and the arm, *g*, against which said spring bears, and we extend the thread and lay it over the back needle after it has passed through the cloth, and in such manner as to enable the needle to receive the thread into its eye when the needle is drawn back. The said needle during its retraction will draw the thread through the cloth and the back thread-guide, and continue to draw upon the thread until that end of the thread which was not held by the spring, as before mentioned, has been drawn entirely through the cloth and the inner thread-guide. The front needle in the meantime has advanced and passed through the outer thread-guide and entirely through the cloth, and to the extent of its motion inwards. During such advancement a lateral movement of the inner thread-guide towards the right causes the thread to be laid over the said needle. The needles next are moved forward, and during such movement the thread passes into the eye of the outer needle, is drawn through the cloth and the front thread-guide, and entirely out of the other needle, which passes through the cloth as before and under the thread, which by the natural movement of the outer thread-guide has been laid or left over it ready for the next back movement of the needle.

The circular motion of the cloth-holder is to be regu-

larly intermittent, each movement of it being a sufficient distance to produce the length of each stitch as required to be made in the cloth. In order to produce the stitch and backstitch, or forward and backstitch sewing, the two needles must not be arranged in the same vertical plane, but they should be arranged respectively, in two vertical parallel planes, situated or supposed to be, at a distance apart from one another, equal to the length of a stitch, the outer needle being placed on the right of the other. The cloth-holder is to be moved forward only during each outward movement of the needle-frame, and such motion should take place while the needles are out of the thread-guides, or cloth. The machinery which produces the intermittent circular motion to the metallic hoop or cloth-holder, is as follows:—The upper surface of the cloth-holder has a series of ratchet-teeth formed entirely around it. One or more pawls or ratchets, s^1, jointed to the lower end of a lever, t^1, works into the said ratchet-teeth. The said lever, t^1, moves upon a fulcrum at u^1, as seen in figs. 2 and 3, and is moved in one direction by the action of the cam, H, and in an opposite direction by a retractive spring, v^{11}, affixed to it, and to a stationary arm, w^1, arranged as seen in the drawings. In the adaptation of my machine to the production of ordinary stitching, that is to say, stitching without a back-stitch, the two needles must be arranged in the same plane with each other; while a forward movement of the cloth-holder should take place during each movement of the two needles, either outward or inward. The cloth-holder has a series of points projecting from its outer surface and close to its lower edge, and at suitable distances apart from one another. The cloth to be sewed is placed upon these points, as represented at A^2, by dotted lines. The friction-rollers of the lower ends of the thread-guide are sprung together by the springs so as to firmly hold the thread when passed between them. Each thread-guide has a stop-screw, x^2, or y^2, applied to it, as seen in fig. 3; the two stop-screws being screwed respectively through projections, z^2, a^3, the whole being arranged in such manner as to enable the screws to serve as rests or stops for their respective thread-guides to bear against under the draft of the connecting-spring at the upper ends of the thread-guides.

Although I have described my invention under certain forms and arrangements of its different parts, as exhibited

in the drawings, yet I do not intend to confine it always thereto, as I mean to make use of any others which may be adopted to advantage, while I do not essentially change the principle or character I claim as new.

What I claim as my invention is,

The combination of two needles, two thread-guides, and a cloth-holder made to operate together substantially in the manner and for the purpose, as hereinbefore set forth.

And I also claim the improvement of making the needles with springs and applying mouth-pieces or pressers to them, and on each side of the flanch of the base-plate, the whole being substantially, as above described.—In witness, &c.

FREDERICK R. ROBINSON.

Enrolled May 7, 1851.

Specification of the Patent granted to JOHN CLARE, *Junior, of Exchange-buildings, Liverpool, Gentleman, for Improvements in the Manufacture of Metallic Casks.*—Sealed November 7, 1850.

WITH AN ENGRAVING.

To all to whom these presents shall come, &c., &c.—My invention consists of making metallic casks by forming and combining staves and parts of sheet metal in such manner, that casks constructed of such staves and parts, may be readily taken apart, and with facility put together again, so that when not required for use the staves and parts may be packed away, in like manner to casks of wood, and occupy comparatively small space. It will therefore be understood that the object of my invention is to construct metallic casks in such manner that they shall consist of staves and heads of sheet metal in place of wood, such metal staves and heads, however, being very thin, as compared with staves and heads made of wood; and in order to get stiffness sufficient for the staves to retain their proper form, and also for the casks made up therefrom retaining their form. I cause the edges of the staves to be bent or shaped to produce such bulge to the casks as may be desired, and the edges of each stave are bent or formed with flanches, which flanches come together and butt

against each other, these flanches in putting together a series of staves to form a cask, may be drawn together by screws and nuts when desired, or by hoops only, or by hoops and screws and nuts; and in fixing the heads I prefer to make a groove at each end of such stave by bending the ends or by riveting angle-iron thereto, the heads entering into such grooves. The heads I either make of sheet metal, plain dished, or with cross-bars riveted on them, and they may be made of wood.

The manner of forming and fixing the heads may, however, be varied. In order that my invention may be more fully understood I have shown by a drawing annexed various views of the parts separately. And also a view of a metal cask complete and made up of several metal staves, according to my invention.

Description of the Drawing.

Fig. 1, shows a cask made of a series of metal.

Fig. 2, is a section thereof.

Fig. 3, shows different views of one of the staves, all the staves being alike, (when for the same form of cask,) the describing of one will, therefore, be sufficient, and the size and form of the staves will vary according to the bilge or size and form of the cask intended to be made, according to my invention. Each stave is composed of sheet metal bent or formed into the proper curvature for the bilge or size, and form the cask to be made; the edges, *a*, *a*, are bent so as to form border surfaces or flanches to come more compactly and securely together than the simple thickness of metal would offer, and it is in this particular that casks made of metal staves differ from those made from staves of wood flanges, *a*, *a*, of the staves, do not extend the whole length of the staves, for where heads are to be fixed there are to be suitable means resorted to for receiving such heads; and for this purpose I prefer to employ angle-iron, *b*, *b*, riveted, as shown, between which the heads, whether of metal or wood, are received, as is shown by the drawing. In place of having the flanges, *a*, *a*, formed on the staves, they may be made of separate pieces of angle-iron and riveted to the edges of the staves, or in place of employing flanges the staves may be made, as shown at fig. 4. But I prefer the staves to be made with flanges or turned-up edges, as shown in figs. 1, 2, and 3. The hoops may be wood hoops, such as are used in ordinary wood casks, or

they may be of metal, in which case they may be drawn together by means of screws and nuts or by cotters, which are means which have before been resorted to for constructing and employing hoops for wood casks. In putting metallic casks together, which consist of staves, I employ sheet india-rubber or other packing where parts come together, in order to keep the parts fluid tight when the casks are to contain fluids.

In figs. 1, 2, 3, the staves are shown to be fastened together by screws and nuts inside, through the flanches, *c*, as well as by hoops outside.

In fig. 5, clamps are used in place of screws and nuts. And in order to prevent the metal (particularly when sheet-iron is employed) oxidizing, I paint the surfaces, or I coat the same with zinc; but these matters in themselves form no part of my invention, and will readily be resorted to according to the purpose to which such casks are to be applied.

Having thus explained the nature of my invention, and the manner of performing the same, I would have it understood that I claim the making of casks of staves made of sheet metal.—In witness, &c.

JOHN CLARE.

Enrolled April 7, 1851.

Specification of the Patent granted to RICHARD EDWARD HODGES, *of Bycroft, in the County of Hertford, for Improvements in Mechanical Purchases, which are also applicable, in whole or in part, to Projectiles.*—May 29, 1849.

WITH AN ENGRAVING.

To all to whom these presents shall come, &c., &c.—My invention consists,

Firstly, in substituting for the rigid tackle ordinarily employed in pulling and hauling, or in employing in combination therewith, tackle of a highly elastic quality, and applying the said elastic tackle in such manner that a single man may, with the help thereof, bring any required amount of mechanical force to bear against the resistance of any body desired to be moved. The principle on which this

improved tackle is constructed will be readily understood from an inspection of fig. 1, of the drawings annexed. A, B, represents what I call a single purchase, it consists of a piece of vulcanized caoutchouc tubing, of about a foot in length, three quarters of an inch outside diameter, half an inch bore, and about three ounces in weight. A piece of these dimensions, if of good quality, will admit of being stretched, without overstraining or risk of breaking, to the length of six feet, by the application of a force of from sixty-five pounds, which is not more than a man of medium strength may easily exert at a dead pull. Supposing, therefore, such a piece of tubing is loosely attached to any body, *a*, desired to be moved, and then drawn out to the above extent by a man's power, and made fast to another body, *b*, which is a fixture as a post or tree, the piece will obviously exert a resilient force, tending to the removal of the least resisting of the two bodies, *a* and *b*, exactly proportional to the force which was used to elongate it; and if a number of such purchases be applied in the same manner, there will be the power of as many men exerted to draw the body, *a*, as there are pieces applied. And in this way a single man may, by a succession of individual efforts, bring into operation, upon any body desired to be moved, the power of a hundred or more men; each purchase must necessarily have a hook or loop or ring at each end, by which it may be stretched and made fast; and this I accomplish in several ways, either I stretch the end of the piece of tubing to about six or seven times its ordinary length, and whip the point which has been so extended round with tarred or waxed twine or wire, and then form the whipped part into a loop, making the turned-over end fast, by countering in the usual way; or I make use of a loop of twine attached to the elastic purchase in the manner represented in fig. 2. D, is a hollow knob or carrier of wood, which is turned to nearly the size of the internal bore of the elastic tube, and has a deep groove, *d*, all round the middle of it. E, is a cord or rope, which is knotted at one end, and then passed through the carrier, D, after that a loop to pull by is formed on the other end. The elastic tube is then drawn tightly over the carrier, with the rope inside of it, until it comes over the groove, *d*, when it is whipped with twine or wire, which presses the material of the tube into the groove, *d*, and thereby makes the carrier immoveably fast, leaving the loop projecting from the end of the tube ready to be

attached as required; or, thirdly, a piece of cord looped at one end, and knotted and tapered off at the other end, may be directly passed through the tube without the interposition of any carrier, as represented in fig. 3; the tube should be well stretched and whipped round at the part between the eye and knob with wire or small cord as before. Whichever of these modes of fitting the purchase with a loop is adopted, the loop may be strengthened by inserting a metal thimble into it as in ordinary tackle.

The purchase represented in fig. 1, is of one foot only in length, and this I find to be a very suitable length for most practical purposes, but the length may be increased to any extent, which convenience may dictate, and instead of the whole being of vulcanized caoutchouc, it may be lengthened by the addition of a tail-piece of ordinary rope or cord or chain; and so also the strength of the tube may be increased to any required degree, but on this head it is important to observe that the strength of the tube, and consequently the amount of resilient force it exerts, is always in exact ratio with the weight of the tube, wholly irrespective of its diameter. When the strength of the tube is increased beyond the power of a man to stretch it out to the desired extent, then a number of men may be employed to draw out, through the intervention of any ordinary tackle, or even the power of horses or other animals may be employed for the purpose. Instead also of the purchases being made tubular, they may be made of solid vulcanized caoutchouc, either round or flat, or of any other shape, but I prefer the tubular form to any other; metal springs fitted to frames, as represented in fig. 1[a], might in some cases be substituted for the vulcanized caoutchouc purchases before described, and applied singly and successively in the same way as the others, or the two sorts of springs may be used in combination; but I prefer employing, in all cases, the vulcanized caoutchouc purchases alone. An exemplification of the application of a number of such purchases to the raising or moving of heavy bodies, say from 200 to 400 lbs., is given in fig. 4. A, is a hook which is attached to the body to be raised, and is fitted at the shoulder with a number of small auxiliary hooks, *a, a.* B, is another hook, which is made fast somewhere above the point to which the body is to be raised. D, D, are a series of elastic purchases, such as represented in fig. 1, and before described, which are suspended from the upper hook, B. The number of these

purchases may be proportioned in number with considerable exactness to the load to be raised, calculating roughly the weight of the latter in pounds, dividing by sixty (the equivalent force in pounds of each purchase) and using as many purchases as there are units in the quotient. The lower ends of these purchases are successively laid hold of by the person conducting the operation, and pulled down over the auxiliary hooks, *a*, *a*, on the large hook, A, till the body is raised. C, is a guard or safety-line, which connects the two main hooks, A and B, and is used to prevent over straining.

Fig. 5, shows how the same system of combined purchases may be applied to the hauling of bodies along the ground. The body to be moved is connected to a rope, A, by an eye, E, and to this rope are attached a number of single purchases, B, B, such as represented in fig. 1, and before described. A number of pegs are to be fixed in the ground at a little distance from the point of junction of the purchases of the rope, and well secured. The purchases are then successively drawn out by hand, and made fast to the pegs; and when the whole have been thus made fast, the body will be moved forward to a distance proportionate to the resilient force exerted, less the ground friction. The purchases are to be then released, and the pegs moved further forward, when the purchases are to be again made fast to them as before, and the body moved a further distance forward. And so by repeating the same round of operations, as often as need may be, the body may be moved to any distance required; and this, whatever its weight may be, if thought fit, by one hand only being required to conduct the operation.

Fig. 6, shows how the same system of combined purchases may be applied to the tightening of ropes, such as ships' rigging, &c. A, is the rope to be tightened. B, B, the elastic portions of the purchase, which are successively extended and attached to the cleat, C. When the proper strain has been produced by the combined force of the purchases, B, B, then the rope itself is tightened and belayed upon the fastening at D.

Fig. 7, illustrates a similar application of my invention to the purpose of bringing together the ends of a rope which has given way (as in the rigging of vessels), so that they may be again connected together. A, A, is the rope. B, B, B, the purchases; but, instead of having the purchases in this case of the form represented in fig. 1, they may be each

formed of a ring of vulcanized caoutchouc. A number of such rings extended and placed on the hooks, C, C, will ultimately bring the ends of the rope, A, A, together, as the same effect may be produced by coiling one length of elastic tubing continuously upon the two hooks.

Fig. 8, shows how, by the help of this system of purchases, the raising of a ship's anchor may be effected by a single individual. A, is a buoy cable. B, B, a number of elastic purchases, which are attached at one end to a sliding bit, which is slipped over the cable, A, and at the other end made fast to the boat, and disposed around it that they shall cause the strain to be equally distributed over it.

Fig. 9, shows how my elastic purchases may be employed by invalids for raising themselves in bed. C, C, are the purchases which are attached to a cross rail over head, and then successively attached to a band round the waist of the invalid, until they exert power sufficient to raise from the incumbent position.

Fig. 10, shows the application of the same to an invalid chair. A, is a cushioned bottom, which is attached by a number of elastic tubes, such as has been before described, to the arms, B, B. The combined force of the whole number of tubes must be such that the weight of the user of the chair shall be sufficient to extend them so far as to allow the seat to come down to its proper level in the chair. In either rising from or sitting down upon the chair, these elastic purchases will afford great assistance to the user.

Fig. 11, exemplifies the application of such purchases to the stretching of tent ropes.

Fig. 12, the application to a suspender for horses, as on board of ship; and

Fig. 13, their application to the man-ropes of a ship, in which latter case they would afford great facility for getting in and out of a boat in a rough sea.

Figs. 14, 15, 16, 17, and 18, are illustrations of other cases in which these purchases may be employed with advantage to give assistance in the performance of certain offices, which, without their aid, would be either tiresome, difficult, or impossible.

Fig. 14, represents a bridle suitable for assisting either a light or weak person to manage a horse of great power, or "hard mouthed." A, is the bit. B, B, are two strands of an elastic purchase, each strand consisting of three tubes, which is attached at one end to the bit (one strand at each

side of the bit), while the other ends are drawn back with a certain amount of force and attached to the saddle, and so counteract, to a certain extent, the pull upon the rider, leaving him in perfect command of the horse by the other reins, C, C, which are held in hand.

Fig. 15, shows how a similar assistance may be derived from such purchases by drivers of horses in harness. A, A, are the elastic purchases, which are attached to the back rail, B, of the seat and to the reins.

Fig. 16, is a saddle-girth attachment. A, A, are the ends of the girth. B, the strap. D, D, D, the buckles which are fixed to the ends of the elastic pieces, E, E, E. In using this attachment, the buckles are drawn and attached to the strap, B, one after another. The drawing up of each buckle separately is very easily accomplished, while the strain of the whole combined is such as only a strong person would be able to produce by other means.

Fig. 17, shows how such purchases may be very beneficially employed, as in moving and holding large articles, such as beams and shafts, while in the course of being fitted into their places or buildings and machines. A, is a fixed beam. B, B, a series of elastic purchases similar to fig. 1. C, D, are the ends of two beams intended to be fitted together. The beam, C, is suspended by the purchases, B, B, from the beam, A, while the operation of fitting is going on; the advantage of using these elastic purchases in cases of this sort is, that by a little assistance, either in pressing down or raising up the parts to be fitted, they can be easily brought to the same level which, when such operations are managed by means of rope tackle, the rigidity and non-elasticity of the rope oppose great obstacles when a small range of movement only is required.

Fig. 18, shows a very useful application of these elastic purchases as helps to the muscles of the arms or of the legs in cases of paralysis or weakness. The case supposed in the figure is that of a person with an arm affected. A, is an elastic tube which is attached at one end to the shoulder by being passed round the back, or in any other convenient way, and terminates at the other end in a loop to embrace the hand or the thumb. The strength of the elastic tube should, of course, be made such that it shall very nearly support the weight of the fore-arm when the tube is in an extended state; in which case, when the wearer wishes to raise his hand, as in eating, &c., a very slight exertion will

suffice to enable him to do so. If the purchase, however, is intended to give great assistance to the arm, as in the performance of some mechanical operation, then it must be of proportionally greater strength; in this latter case, considerable force may be required to put out the arm and extend the purchase; but in drawing in the arm towards the body that force is again given out, and is supposed to be exerted in producing the requisite mechanical effect.

Fig. 19, represents how my improved elastic purchases may be employed to form an intermediate connexion in towing-ropes to prevent danger or risk of the rope being broken by the dragging of a vessel. A, A, is the towing-rope, B, an elastic purchase, which is attached to and forms a portion of the rope. A, C, is a guard which prevents any undue stretching of the purchase, and is affixed to the rope at D and E; where the other end of the rope passes through it, there is a stop which prevents the enlargement at F, from passing through, so that when the purchase becomes extended the whole length of the guard, the resistance of the guard comes into action along with the purchase itself. The different exemplifications which I have given of the application of my improved system of purchases will suffice to illustrate and make plain the general principle on which it is founded, and leave it a matter of no difficulty to any person of competent skill to support such modifications as may be necessary to adopt them to all other cases where a drawing, pulling, or resilient force is required to be exerted.

Secondly, my invention consists in the application of purchases of the same elastic quality, as before described to projectiles, such as guns, bows, harpoons, strings, &c., whereby bores may be projected from them with a force and to a distance scarcely exceeded, where gunpowder is employed as the propulsive agent.

Fig. 20, is a side elevation; and

Fig. 21, a plan of an elastic projectile, constructed after the manner of an ordinary fowling-piece, which would be well adapted for deer-shooting, as it will carry a long way, and be attended with neither noise nor smell.

Figs. 22 and 23, are side elevations; and

Fig. 24, a plan on an enlarged scale of these parts, which correspond with an ordinary gun-lock. A, is the stock; B, B, the barrel, which is composed of two concave pieces or half cylinders joined at the ends, but separated by a longitudinal groove or slot, *a*, *a*, *a*, on each side. A cross section

of this barrel is given separately in fig. 22^{d}. c, c, are a number of elastic pieces, similar to those before described, which are laid crosswise between the two halves of the barrel, and whipped together at the middle by cord, so as to be united into one at that part, and to be of a size somewhat less than the slot, *a*, *a*, of the barrel. Each purchase has a lock, *c*, and attached to the end of it, by which it may be hooked on, as afterwards explained, to one or either of the two horns, G, G, affixed to the muzzle of the piece. Two eyes, *e*, *e*, are attached to the whipped or middle part of the purchases, and through these eyes and holes, *e*^{1}, *e*^{1}, made to correspond with them in the sides of the stock, a detent, *n*, of catgut, gutta percha, stiff cord, or other like substance is passed. A view of the detent, *m*, detached from the gun is given in fig. 23$''$. r, is a trigger-knife, which, in being drawn in the same way as the trigger of an ordinary gun, cuts the detent in two, and allows the purchases to fly forward towards the end of the gun. In using this weapon, the whipped part, *n*, where the tubes are joined together, is first drawn back, and made fast as before described, by the detent, *m*, after which the missile is dropped down into the gun. The shooter then takes hold of one of the purchases by the loop, *c*, and, stretching it out, hooks it on to one of the horns, G. He then takes hold of another of the purchases, but on the opposite side of the barrel, and stretching it in the like manner, it hooks on to the other horn, G. In the same way he stretches out the remainder of the purchases, and makes them fast to one or other of the horns, taking care always to attach each purchase to the horn on the same side with it. The discharge of the missile is then effected by drawing the trigger which cuts the detent in two, and sets free the whole body of purchases, c, c, which drives the missile before them with immense force. The whipped part of the purchases, or that part where they are united in one, catches near to the muzzle of the gun against an elastic stop, H, which prevents the purchases from doing any injury to the rigid parts at the end of the gun, or causing any unpleasant shock to the person handling it. Even shot may be discharged from such a weapon by making it up in a cartridge, and affixing a small ring to the muzzle of the piece, having three or four projecting lance points, *c*, *c*, (fig. 23$'$) to cut the paper of the cartridge as it is issuing from the muzzle, and thereby to discharge the shot. Instead of the arrangement before described for discharging the

missiles, one more nearly resembling the locking a common gun may be employed; as, for instance, the purchases might be held back by a hook under the control of the tumbler, while the tumbler might be set free by the trigger.

Fig. 24[d], is an external elevation of another apparatus or instrument for discharging projectiles by elastic force, constructed upon the same principle as the preceding. A, A, is the barrel; B, B, are a series of elastic purchases; C, a catch to which they are affixed in charging or preparing the apparatus; D, D, are hooks, to which the free ends of the elastic pieces are hooked.

The discharge is effected in this case by grasping and pulling together the levers, E, E, one of which has its fulcrum at F, and terminates at the shorter end of the catch, C, which holds the elastic purchases, B, B, until ready to be discharged. *g*, is a locking piece, which must be drawn back before the lever, E[1], can be liberated. An apparatus of this sort would be very applicable for throwing ropes in cases of shipwreck, or for projecting balls, arrows, or signals.

Fig. 25, represents another apparatus for throwing arrows, which may be held in the hand. A, is a wooden ferule or cup, with a hole, B, passing right through it. C, is an elastic purchase, the two ends of which are fixed to the ferule, A, either by being passed through it, as represented, or by any other means. D, is part of an arrow, which is passed through the hole, B. When the arrow is drawn, the recoil, from the elasticity of the purchase, is sufficient to project the arrow to a great distance.

Fig. 26, represents a bow constructed on the same elastic principle. The arc, A, of the instrument is eighteen inches long between the two ends, and consists of some rigid substance, such as metal pipe, &c., of a strength equal to sustaining a strain of, say, twenty pounds. The cord or bowstring is made of vulcanized caoutchouc tubing, and in its unstretched state is about nine inches long. This cord is first stretched at the centre to about five or six times its usual length, and whilst in that state whipped round with twine or covered wire. This forms the seat for the bottom of the arrow. The ends are then stretched and whipped in like manner, after which they are formed into loops and attached to the ends of the rigid piece, in the usual manner. With such a bow as this an arrow of two feet in length, and weighing about half an ounce, may be projected about 130 or 140 yards.

Fig. 27, is a sectional elevation of a hand-sling for projecting stones, balls, &c. It consists of a metal or wooden ring, A, to which there is affixed a tapering tube, B, made of vulcanized india-rubber and closed at its lower end. The stone or other object to be projected is put into the tube, which is then extended by the one hand, while the ring, A, is held in the other; on letting go the end of the tube the sudden spring or contraction of the tube causes the stone to be projected out of it with great violence.

Fig. 28, represents a modification of the contrivance last described, whereby it might be adapted to the projecting of a rope from a vessel to a quay, or *vice versâ.* A, is the rope; B, a piece of elastic tubing; C, a piece of wood affixed crosswise to the end of B; and D a ball, also made of wood or gutta percha, or some other comparatively soft substance, to which the rope is to be thereon attached. The cross-piece, C, is put into a notch in a knee-piece, E, temporarily fixed in some part of the vessel, and the elastic purchase there extended as far as may be thought necessary. When this has been done, the moment the elastic purchase, B, is set free, the ball, D, will fly off, carrying the rope, A, along with it to the shore.

Fig. 29, represents the application of my elastic purchases to the breeching of guns on board of ships. A, is the gun; B, the carriage; C, part of the hull of the vessel; D, D, two strong elastic purchases, which are attached at one end to the carriage, and at the other end to the rings, E, E, and thereby connected with the frame-work of the vessel; F, is a chain, which is affixed at one end to the after-part of the carriage; the other, or free end, has an elastic purchase, G, joined to it; when the gun is to be brought into use the elastic purchase is extended until it exerts a considerable pull upon the chain, and is fixed to some convenient point, say, at H. If the gun be fired off under these conditions, the recoil will cause the carriage to fly backwards, while the purchase, G, will at the same instant pull back the chain, F, and as each successive link passes through the spring-stopper, I, I, which it is free to do in the one direction, it is caught so that it cannot pass back again until liberated from the stopper. The gun is by this arrangement held back at the utmost limits of its recoil, in which position it is kept till loaded. On the stopper being set loose the force exerted by the purchases,

D, D, will bring the gun forward into the post ready for action; the chain and stopper may be encased in a covering of thin metal or wood.

Thirdly, my invention consists of certain additions to a travelling staff, whereby it may be converted on occasion into a sort of hand carriage for the conveyance of bundles or packages.

Fig. 30, represents this branch of my invention. A, is a round staff with a cross-handle; B, C, is a small wheel fitted to the lower end, and D, a hook attached to the middle of the staff on to which the bundle or package is to be hooked. An instrument of this sort of five feet in length, which is a good average length, weighs only about two pounds, and will enable a pedestrian to carry along with him a weight of from forty to fifty pounds, with little more effort than that of holding up the stick at a fit angle of inclination for travelling. The staff may have two wheels fitted to it, one in advance of the other, as represented in fig. 31, the third wheel being the larger of the two, whereby it may be moved over uneven ground with greater ease. Loads of even greater weight than forty or fifty pounds may be carried by an instrument of the same sort, by increasing the length and strength of the instrument, and they may be attached to the staff in various other convenient ways.

Fourthly, my invention consists in a hand-barrow of the improved construction, represented in fig. 32. In this barrow two bearing-frames, A, A', with handles, are attached to the axle, B, of one pair of wheels, and connected lengthwise by a strap or chain, C. Two men with a barrow of this construction may do three times the work which one man can do with a single barrow of the ordinary form. The arms, A, A, may be attached to the axis independently of each other.

And having now described the nature of my said invention, and in what manner the same is to be performed,

I declare that what I claim as the improvements constituting my said invention, are as follows:—

First, I claim the employment for pulling and hauling purposes, and all others where a resilient force can be usefully applied, of purchases made of vulcanized caoutchouc or other like elastic substance, either solid or tubular, and either round or flat, or of any other shape, and fitted with loops or hooks for attaching the same singly and succes-

sively to the bodies which are thereby to act or to be acted upon, as before exemplified and described.

Secondly, I claim the application of elastic purchases of the description aforesaid to projectile purposes, as also before exemplified and described.

Thirdly, I claim the improvements in travellers' staffs, as above described; and,

Fourthly, I claim the double wheel-barrow, as above described.—In witness, &c.

RICHARD EDWARD HODGES.

Enrolled November 29, 1849.

Specification of the Patent granted to JONAS BATEMAN, *of Upper-street, Islington, in the County of Middlesex, for Improvements in Life-boats.*—Sealed November 2, 1850.

To all to whom these presents shall come, &c., &c.—Let a boat-frame be constructed of any approved material and of dimensions suitable for the number of persons it is intended. The boat-frame being strongly fastened by means of any approved fastenings to cross-partitions about one inch and a half in thickness, it is necessary that the deck and bottom of the boat should be precisely similar in size, and the deck must have circular holes cut to receive cylinders to be hereinafter described, viz., strong water-tight cylinders about sixteen inches in diameter and thirty-six inches in depth passed through the holes in the deck and resting on the bottom of the framing of the boat on the inside thereof, the space between the bottom of each cylinder and the bottom of the boat being filled in with wood, to give it a solid resting on the bottom of the boat-frame; then insert strong metal screws, sufficiently long to pass through the entire substance of the bottom of the cylinder and the bottom of the boat-frame, to give strength and prevent any inclination of the cylinder to rise from the pressure of water from beneath when immersed; then with prepared cork, entirely fill the whole of the interstices between each of the cylinders, and the inside of the boat-frame, so as to render the whole a solid mass, with the

exception of the interior of the cylinders, each of which is intended to receive one person. Then drive a stout wood-hoop upon each of the cylinders upon the deck and fasten such hoop to the cylinder by means of screws, sufficiently long to pass from one cylinder to the next in position, after which pass a flexible waterproof article round the open end of each cylinder, attaching it thereto by a similar wood-hoop; the flexible article is to be tied round the waist of the persons using the boat, and will effectually prevent the sea from breaking into the cylinder, and consequently keep the persons dry, but it need not be so tight as to prevent the persons placing themselves in a sitting posture upon the upper part of the boat. A strong wrought-iron keel about three inches wide by two inches thick is to be fastened to the outside of the bottom of the boat (running the whole length thereof), by means of strong iron bolts passing through the entire depth of the boat; such bolts are to have strong metal eyes to screw on their upper ends down upon the deck; the keel and bolts will give additional strength to the whole and assist to prevent its upsetting; the eyes screwed on the ends of the bolts, are intended to have ropes or chains passed through them to hoist and lower the boat in or out of the ship, or attach it thereto until the persons are placed; the upper end of each of the cylinders are to have covers constructed upon any approved principle and of any approved material to keep out the water and prevent injury to the cylinders when the boat is not in use. Any number of additional fastenings may be used that are thought necessary.

I do not claim as my invention any of the articles of which the boat is constructed separately considered.

But I do claim as my invention,

The combination of the several articles agreeably to the arrangement hereinbefore described, for the purpose of a life-boat that will give perfect security in shipwreck.—In witness, &c.

JONAS BATEMAN.

Enrolled May 2, 1851.

Specification of the Patent granted to JOHN MERCER, *of Oakenshaw-within-Clayton-le-Moors, in the County of Lancaster, Gentleman, for Improvements in the Preparation of Cotton, and other Fabrics and Fibrous Materials.* —Sealed October 24, 1850.

To all to whom these presents shall come, &c., &c.— My invention consists in subjecting vegetable fabrics and fibrous materials, cotton, flax, &c., either in the raw or manufactured state, to the action of caustic soda, or caustic potash, dilute sulphuric acid, or chloride of zinc, of a strength and temperature sufficient to produce the new effects and to give the new properties to them, which I have hereafter described.

The mode I adopt of carrying into operation my invention to cloth made wholly or partially from any vegetable fibres and bleached, is as follows:—I pass the cloth through a padding machine charged with caustic soda, or caustic potash at sixty or seventy degrees Twaddel's hydrometer at the common temperature, at, say, sixty degrees Fahrenheit or under, and without drying the cloth wash it in water, then pass through dilute sulphuric acid, and wash again. Or I run the cloth over and under a series of rollers in a cistern with caustic soda or caustic potash at from forty to fifty degrees of Twaddel's hydrometer at the common temperature of the atmosphere; the last two rollers being set so as to squeeze the excess of soda or potash back into the cistern; the cloth then passes over and under rollers placed in a series of cisterns charged at the commencement of the operation with water only, so that at the last cistern the alkali has nearly been all washed out of the cloth; when the cloth has either gone through the padding machine or through the cisterns above described, I wash the cloth in water, pass it through dilute sulphuric acid, and wash again in water.

When I adopt the invention to grey or unbleached cloth made from the fibrous material before mentioned, I first boil or steep the cloth in water, so as to have it thoroughly wet, and remove most of the water by the squeezers or hydro-extractor, and then pass the cloth through the soda or potash solution, &c., and proceed as before described.

I apply my invention in the same way to warps, either

bleached or unbleached; but, after passing through the cistern containing the alkali, the warp is either passed through squeezers or through a hole in a metallic plate, to remove the alkali, and then passed on through the water cisterns, soured and washed as above described.

When thread or hank yarn is operated on, I immerse the thread or yarns in the alkali, and then wring them out, as is usually done, in sizing or dyeing them, and afterwards wash, sour, and wash in water as above described.

When I apply my invention to any fibre in the raw state, or before it is manufactured, I first boil it in water, and then free it from most of its water by the hydro-extractor, or a press. I then immerse it in the alkaline solution, and then remove the alkali by the hydro-extractor; or I press the alkali out with a press, and then wash in water, sour, in dilute sulphuric acid; wash again, then remove the water by a press or hydro-extractor, as above described.

When cloth made from vegetable fibre, cotton, flax, &c., has been subjected to the action of caustic soda or potash, as above described, by padding, immersion, or any other way, and then freed from the alkali by souring and washing according to my said invention, the cloth will be found to have undergone certain changes and alterations, and have acquired certain new and valuable properties; the most remarkable I here describe.

It will have shrunk in its length and breadth, or have become less in its external dimensions, but thicker and closer, so that by the chemical action of caustic soda or potash I produce, on cotton and other vegetable fabrics and fibres, effects somewhat analogous to that which is produced on woollen by the process of fulling or milling.

It will have acquired greater strength and firmness, each fibre requiring greater force to break it.

It will also have become heavier than it was before it was acted on by the alkali, if, in both cases, it be weighed at the temperature of sixty degrees Fahrenheit, or under.

It will have acquired greatly augmented and improved powers of receiving colours in printing and dyeing.

The effects of the application of my invention to the vegetable fibre in any of its various stages, before it is manufactured into cloth, will be readily understood by reference to its effects upon cloth composed of such fibres.

Secondly, I employ sulphuric acid diluted to 105 degrees Twaddel's hydrometer, and at sixty degrees Fahrenheit, or

under. I use this acid mixture instead of caustic potash or soda, and operate in all respects the same as when I use soda or potash, except the last souring, which is here unnecessary.

Thirdly, when I employ solution of chloride of zinc instead of soda or potash, I use the solution at 145 degrees Twaddel's hydrometer, and 150 to 160 degrees Fahrenheit, and operate in all respects the same as when I use soda or potash.

When I operate on mixed fabrics, partly of vegetable and partly of silk, woollen, or other animal fibres, such as delaines or leans, &c., I prefer the strength of the alkali not to be above forty degrees Twaddel's hydrometer, and the heat not above fifty degrees Fahrenheit, lest the animal fibres should be injured.

I may, in conclusion, remark, that the description of the apparatus or machinery, and the strength and temperature of the soda or potash, sulphuric acid, or chloride of zinc solution, may be varied to a considerable extent, and will produce proportionate effects without at all deviating from my invention. For instance, caustic potash or soda may be used even as low as twenty degrees, Twaddel's hydrometer, and still give improved properties to cotton, &c., in receiving colours in printing and dyeing, particularly if the heat be low, for the lower the temperature, the more effectively the soda or potash acts on the fibrous material above described. I, therefore, do not confine myself to any particular strength or temperature of the substances I employ, but the particular strength, heat, and process here described is what I have found the best, and which I prefer.

And I claim, as of my invention, the subjection of cotton, linen, and other vegetable fibrous material, either in the fibre or any stage of its manufacture, either alone or mixed with silk, woollen, or other animal fibrous material, to the action of caustic soda or caustic potash, dilute sulphuric acid, or solution of chloride of zinc, of a temperature and strength sufficient to produce the new effects, and give to them the new properties above described, either by padding, printing, or steeping, immersion, or any other mode of application.—In witness, &c.

JOHN MERCER.

Enrolled April 24, 1851.

Specification of the Patent granted to BENJAMIN GUY BABINGTON, *of George-street, Hanover-square, in the County of Middlesex, Doctor of Medicine, for Improvements in Preventing Incrustation of Steam and other Boilers.*—Sealed November 7, 1850.

To all to whom these presents shall come, &c., &c.—My invention consists in the employment of voltaic agency as a means of protecting steam and other metallic boilers from incrustation, by connecting with such boilers a portion or portions of a more oxidable metal than that of which the boilers themselves consist, such more oxidable metal to be placed within the boiler, and in such a position as to be immersed in the water contained in the boiler, and in metallic contact with the boiler itself.

The plan which I have found in practice to answer best, is as follows:—

I solder to the interior of the boiler, by the ordinary soft solder, a sheet of zinc of the ordinary zinc of commerce, of sixteen ounces weight to the square foot, the zinc being soldered by one edge, so as to expose both its surfaces to the water; and being soldered to the boiler at such part, that when the boiler is filled with water to the usual level, the zinc will be wholly immersed in the water.

I have found that a good proportion for the surface of the zinc to bear to that of the interior surface of the boiler which is covered with water is one fifteenth, calculating only one surface of the sheet of zinc.

In process of time the zinc becomes corroded. This effect takes place slowly; but when the zinc is much reduced, a fresh sheet should be soldered in place of the worn one, and when the boiler is large, two, three, or more sheets of zinc should be soldered in different parts of the boiler. The whole one-sided surface of such sheets being to the whole surface of the boiler exposed to the water in the proportions I have above indicated. By these means I have found that the voltaic action set up between the zinc, the metal of the boiler, and the water, prevents those incrustations which usually form on the interior of boilers, and which have in practice been found very injurious.

Having stated the means which I employ, and which I have found in practice successful, I further state that I do not confine myself to the exact details, as the proportions of

the metal employed, the means of effecting metallic contact, or such conducting connexion as is sufficient to enable voltaic action to take place, and other details, may be varied, and still the boilers may be effectually protected; but I have given that plan which I have found in practice to answer best.—In witness, &c.

BENJAMIN GUY BABINGTON.

Enrolled May 7, 1851.

Specification of the Patent granted to ADOLF FREDERICK GURLT, *of Manchester, in the County of Lancaster, Gentleman, for An improved Method of Extracting Silver from Argentiferous Minerals.*—Sealed October 10, 1850.

To all to whom these presents shall come, &c., &c.—Before I proceed to describe the particulars of my invention, I first shall shortly refer to those methods which are at present generally adopted for the purpose of extracting silver from argentiferous minerals, that the peculiarities of my invention may be more clearly understood. These methods are—

First, the eliquation process, in which the argentiferous substance is mixed with lead or any suitable combination of lead; the silver combines with the lead owing to its great affinity for that metal, and is afterwards separated from it by the process of cupellation, which is well understood.

Secondly, the European method of amalgamation, in which a chloride of silver is formed by mixing common salt in a reverberatory furnace with the calcined ore or regulus, which chloride is then reduced to the metallic state by means of metallic iron, and dissolved by mercury, thereby forming an amalgam, which is separated from the ore or regulus by washing processes, and is then deprived of its mercury by distillation, leaving metallic silver behind.

Thirdly, the American amalgamation process, which consists in mixing calcined copper ore (magistral) and common salt with the ore from which the silver is to be extracted, and by the addition of such a quantity of water as to form a thick pasty mass, in which the chloride of silver thereby

formed is reduced to the metallic state by iron, and is then dissolved by mercury, which amalgam is treated in the same way as that formed by the European method of amalgamation.

Fourthly, a method by which a chloride of silver is obtained in a similar way in a reverberatory furnace, as in the European amalgamation process, and is then dissolved by means of a hot concentrated solution of common salt, hyposulphite of soda, or any other suitable agent which will dissolve the chloride of silver, and separated by means of filtration from the insoluble portions of the material treated; the silver is then precipitated in the metallic state by means of any suitable metal.

Fifthly, a method by which all the sulphuret of silver contained in a mineral is converted by calcination into sulphate of silver, which is extracted by hot water, and then precipitated by cementation.

My improved method consists in subjecting the argentiferous ore or regulus containing silver in the state of a sulphuret, directly to the action of a solution of common salt or its chemical substitutes, such as the chlorides of potassium, ammonium, &c., combined with chloride of copper, iron, zinc, or other suitable metal, by which means the sulphuret of silver is converted into chloride of silver, and dissolved in its nascent state by this solution, so that it may be separated by means of filtration from the mineral with which it was previously combined: any natural chloride of silver (horn silver) contained in the ore is likewise dissolved. The argentiferous solution is then deprived of its silver by cementation, and may again be used for extracting silver from another portion of ore or regulus.

But in order that my method may be more fully understood, I will now proceed to describe the best mode I am acquainted with of carrying the same into effect. I form the solution which I use for my process in the following way:—One hundred parts of the concentrated solution of the chloride of the alkali or earth, and ten or fifteen parts of a concentrated solution of the metallic chloride are well mixed, and heated to about 200 degrees of Fahrenheit previous to its being used. The mineral to be treated may be an ore of copper, iron, zinc, &c., or a regulus of these metals, and is in every case to be reduced to a fine powder, so as to facilitate the lixiviation; when I find that the

gangue of the ore consists of a carbonate or oxide of lime, magnesium, barium, strontium, &c., which exercise an injurious influence on the solution by destroying the metallic chlorides and reducing them to hydrates or oxides, I prefer to remove the injurious matters by means of a smelting process, which converts them into a slag and the ore into a regulus. Should it not be desirable, however, in other respects to smelt the ore, I wash the same with diluted sulphuric or muriatic acid previous to subjecting it to the desilverizing process, whereby in most cases the injurious matters are rendered harmless. I effect the lixiviation by means of revolving casks, such as are used in amalgamation works; these casks are charged according to their size with the mineral to be treated, and with the solution; the latter, I recommend to be added in such proportion as to be equal to at least three times the volume of the mineral. Both mineral and solution should be heated to about 200 degrees of Fahrenheit when put into the casks, unless means are used to heat the contents thereof during the process of lixiviation by steam or otherwise. After some hours' working the solution is tapped out and renewed, which operation must be repeated until all the silver is extracted, the time and the number of changes of the solution being entirely dependant on the quantity of the mineral employed and of the silver to be extracted; the average time required for a charge of five hundredweight of ore or regulus is about twelve hours, in which time three changes of solution are made; I finally wash the mineral with a concentrated solution of common salt or other solvent of chloride of silver, in order to remove the remaining silver solution, which otherwise would be lost. The silver is precipitated from the solution in its metallic state by copper or any other suitable metal. I always prefer that metal, the chloride of which constitutes the solution, because a chloride of the same metal will then be formed equivalent to the silver precipitated, and the solution may at once be used again for extracting silver from another portion of ore or regulus; in other words, a regenerative system of working is established, the silver after precipitation is then washed and refined in the usual way. In case the ore to be desilverized contains with horn silver and sulphuret of silver some metallic silver, but not in such quantity as may be advantageously extracted by mechanical processes, I prefer to smelt the ore, converting thereby

the whole of the silver into sulphuret, which may then be acted on by the solution, as above described. The choice of the metallic chloride to be used in the solution depends to a great extent on the component parts of the ore or regulus. If the mineral to be treated be an ore or regulus of copper, I prefer a solution of the chloride of copper; if of zinc, I then make use of the chloride of zinc as the agent to convert the sulphuret of silver into chloride; if it contain much iron or other metal of no value for succeeding smelting operations, I use the chloride of iron, being the cheapest of those metallic chlorides. As regards the choice of the chloride of an alkali or earth in the solution, I generally prefer the chloride of sodium (common salt), as being the more powerful and cheaper agent; but the chlorides of potassium, ammonium, lime, &c., also answer the purpose.

Having now described the nature of my invention, and the best method I am acquainted with of carrying the same into effect, I wish to be understood that I do not confine myself to the details herein described; nor do I claim the exclusive and separate use of either the chloride of sodium and its chemical substitutes or of the metallic chlorides.

But what I claim is,

The use of a combined solution of chloride of potassium, sodium, ammonium, &c., and of chloride of copper, zinc, iron, &c., for the purpose of extracting silver from argentiferous minerals.—In witness, &c.

ADOLF FREDERICK GURLT.

Enrolled April 10, 1851.

LAW REPORTS OF PATENT CASES.

THE ELECTRIC TELEGRAPH COMPANY *v.* BRETT AND ANOTHER.—JUDGMENT.*

In the Court of Common Pleas, April 26, 1851.—*Sitting in Banco before the Lord Chief Justice Jervis, and Justices Cresswell, Williams, and Talfourd.*

THIS case was one of very considerable importance, the question being whether a machine for working electric tele-

* Corrected by the Judges' own notes.

graphs, made by the defendants, was or was not an infringement of a patent, known as Messrs. Cooke and Wheatstone's patent, now belonging to the Electric Telegraph Company. The case was tried before the present Lord Chancellor, who put certain questions to the Jury, which they answered, and thereupon a verdict was entered for the plaintiffs. The defendants, however, obtained a rule to set aside this verdict, and to enter a nonsuit or a verdict for the defendants, or to have a new trial. The case was argued, and the matter stood over for consideration until this morning, when their Lordships gave the following judgment:—

Mr. Justice Cresswell said, that this was an action by the plaintiffs, claiming as assignees of a patent granted, in 1837, to William Fothergill Cooke and Charles Wheatstone, for "Improvements in giving signals and sounding alarms in distant places, by means of electric currents, transmitted through metallic circuits." The declaration recites the letters patent and several indentures of assignments whereby the plaintiffs became assignees of the letters patent, and alleges infringements by the defendants in using and counterfeiting the invention. The defendants, after setting out the letters patent and the indentures of assignment, pleaded certain pleas denying the plaintiffs' title, as assignees of the patent; and also the plea of not guilty, and pleas denying that the patentees were the first inventors of the improvements, denying that the invention was new, and denying the utility of some parts of the invention claimed in the specification, issues being joined on these pleas. The case was tried before Lord Chief Justice Wilde, at the sittings after Hilary Term, 1850, when a verdict was found for the plaintiffs, and also certain special matters in answer to questions put to the Jury by the Lord Chief Justice, subject to leave to move on the part of the defendants, in pursuance of which, in Easter Term, 1850, a rule was obtained, calling on the plaintiffs to show cause why a verdict should not be entered for the defendants, on the plea of not guilty, or why a nonsuit should not be entered, or a new trial had. Cause was shown against this rule in last Trinity Term. The argument on that occasion turned upon the question, what was the proper verdict to be entered in respect of the special matters found by the Jury, in answer to the questions of the Lord Chief Justice? Those answers were, so far as it is material to state them,

in answer to the third question, that the magnetic ring and indicator of the defendants is a different instrument from the needle claimed in the plaintiffs' specification; in answer to the fourth question, that the sending of signals to intermediate stations was "new to the plaintiffs," by which expression is to be understood, that it was a new invention of the patentees; in answer to the fifth question, that the angular motions of the needles in vertical planes on horizontal axes, conjointly with the stops, were "new to the plaintiffs," meaning, as before, a new invention of the patentees; in answer to the sixth question, that, as a whole, the system of counting with one wire and two needles (which it appeared in evidence was the system used by the defendants) is not the same as the system of the plaintiffs. In the argument on showing cause it was insisted for the plaintiffs, that they were entitled to retain the verdict in respect of the answers of the Jury to the fourth and fifth questions. The defendants, it was said, were guilty of infringement within the terms of the declaration, in having used the matters referred to in those answers, those matters having been duly specified, and being fit subjects of a patent, and comprehended within the terms of the patent itself. Some discussion took place on the argument as to whether the defendants had been shown to have used the matters referred to in those fourth and fifth answers, in the result of which it appeared that the defendants had used the sending of signals to intermediate stations, by means of duplicates, at those stations, of the coils and apparatus used at the terminal stations. As to the fifth answer, it appeared that the defendants had used an instrument moving on a vertical plane, which they called a magnetic ring and indicator, producing the same, or very nearly the same, result as would be produced by the needle described in the specification; but as the Jury, in answer to the third question, have found that the magnetic ring and indicator of the defendants is a different instrument from the needle claimed in the plaintiffs' specification; it was insisted for the defendants that the use of the ring and indicator was no infringement of the patent. This objection applied only to so much of the alleged infringement as consisted in using an instrument or portion of machinery moving on a vertical plane, and is of a much less general and important nature than the objections made to the plaintiffs' right to a verdict in respect of either of the two alleged infringements. The first of

these objections, and that which was mainly relied on for the defendants, was that the patent of the plaintiffs being described in the title, and also the invention patented being described in the whole of the specification, whenever mentioned as an invention for improvements in giving signals, and sounding alarums in distant places by means of electric currents transmitted through metallic circuits, would protect the improvements of the patentees only when such improvements were applied to metallic circuits, and that no use of such improvements would be an infringement of the patent if the electric current acting on the improved machinery were not wholly transmitted through a metallic circuit. And as it no doubt appeared by the evidence, that the electric current used by the defendants had been transmitted through a circuit not wholly metallic, but through a circuit which, though metallic in its larger portion, was not continuously metallic throughout, but was made up in a proportion which, though it must be less than the half of the whole circuit, might be a very large one, by using the earth as the connexion between the two portions of the metal. It was insisted that no infringement had been made by the defendants, or indeed could be made, as long as the circuit they used was not metallic throughout, but to a substantial extent non-metallic. This objection is one of a grave character, and well deserving of consideration; but we are of opinion that, considering it with reference to the specification and to the matters which appeared in evidence at the trial, it ought not to prevail. It appeared in evidence that at the time of the grant of the patent the transmission of electric currents through metallic circuits was known, and that it was also known that the power of the current might be increased by means of coils in the wire by which it was transmitted, so as to deflect the magnetic needle, and thereby give a signal. It also appeared that, after the grant of the patent, it had been discovered that a large portion of the wire through which the current returned to the battery might be dispensed with by plunging into the earth the two ends of wire which would have been joined by the part left out; the electric current, it was discovered, would thus pass from one end of the wire to the other, and so complete the circuit as effectually as if a continuity of wire had been kept up. A circuit on this principle would not be wholly metallic, it would be so in its greater part, and in all that part which contained the coils

and operated on the needles by which signals were given. Now the patentees, by the specification, do not make any claim to metallic circuits; what they claim is improvements in giving signals by means of electric currents, transmitted through metallic circuits, and the improvements, as appears by the specification, consist entirely in methods and instruments for using the electric currents, assuming it to be transmitted by means open to the public, and in respect of which the patentees make no claim. The circuit used by the defendants is metallic in all that part which operates in giving signals, and in all the parts to which the plaintiffs' alleged improvements apply, and it is no condition necessary to the existence of the improvements that the circuit should be metallic in any other part than that which contains the coils, and operates on the needles; and there is no doubt that the patentees might, without any alteration of the description of their invention as contained in the specification, have removed all colour for this objection if they had used words in speaking of the transmission of the current which could not be contended, as those now used are, to be applicable only to currents through circuits wholly metallic. The objection in question may be considered as it regards the specification, and as it regards the title of the patent. With respect to the specification, it is to be observed that the claims of the patentees being for improvements not all immediately connected with or dependant on each other, but all applicable to giving signals, &c., by means of electric currents. The plan adopted in the specification was to give an account of the whole system, or mode of transmission of electric currents, for the purpose of giving signals, and the mode of giving those signals, specifying afterwards the parts claimed as improvements, and either expressly disclaiming or leaving unclaimed all that was not expressly claimed, it is obvious that in such a specification that part which describes the matter claimed is to be much more strictly construed than that which, though necessarily mentioned, is not spoken of as a new matter, or as the subject of a grant, but only as something known and necessary to be referred to for the purpose of explaining the claim. Considered in this view, we think the specification, in speaking of metallic circuits, may properly be considered as comprehending all circuits which are metallic, as far as it is material to the improvements claimed that they should be so, and that the expression in question is not to be construed with more

strictness and precision than is necessary to enable it to fulfil that purpose of explanation for which it was introduced. With regard to the use of the words "metallic circuits" in the title of the patent, it was urged that the patentees, by using those words, would mislead a person who was in possession of improvements indentical with the plaintiffs, but which he intended to use in giving signals by non-metallic circuits, and who might have opposed the grant of a patent of a more comprehensive title, but would acquiesce in one confined to metallic circuits; but it appears to us that whatever might be the case, supposing currents transmitted in the manner used by the defendants to have been known at the time of granting the patent, or of giving notice of the application for it, that the title did, in the actual circumstances of the case, that is to say, the earth circuit not being publicly known, give sufficient notice to any person secretly acquainted with that discovery, or thinking it probable that some such discovery might be made, having also invented improvements like those of the patentees, to put him on his guard, and on an inquiry how far the proposed patent might interfere with him. It appears to us reasonable to hold that a claim for a patent for improvements in the mode of doing something by a known process is sufficient to entitle the claimant to a patent for his improvement, when applied either to the process as known at the time of the claim, or to the same process altered and improved by discoveries not known at the time of the claim, so long as it remains identical with regard to improvements claimed and their application. The second objection was not less extensive than the first, and would allow the full use of all the patentees' improvements, supposing them to be used only in such an apparatus as the defendants used. That objection was, in substance, that the plaintiffs' patent was for a system of giving signals by means of several wires and converging needles, pointing to letters, whereas the defendants had used one wire, and had made signals by counting the deflections of a needle or needles, which was found by the jury to be a different system from that of the plaintiffs. This objection appears to us to be founded on a wrong construction of the specification, which, we think, shows the patent not to be for a system of giving signals, but for certain distinct and specified improvements, comprehending those now in question; the system being described only for the purpose of explaining the improvements claimed. Another objection, some-

what connected with that last mentioned, was urged for the defendants, that the breaches in the declaration being, that the defendants had used and counterfeited the invention of the patentees, was not supported by evidence of the use or counterfeiting of part only, but in looking at the specification, which explains what the invention is, it appears to consist of nine specified improvements, and the declaration, in speaking of the said invention, is to be considered as if it charged the using, &c., of the said nine improvements, and is sufficiently proved by showing that one of them has been used. It appears to us, therefore, that none of the objections which apply to both grounds on which the plaintiffs claim their verdict, "in respect of vertical needles and of duplicates at intermediate stations," ought to prevail. With respect to the objection before adverted to, as to the claim to the verdict, regarding vertical needles, on considering the finding of the jury, with regard to the defendants' instrument, in conjunction with the claim in the specification, page 23, paragraph 123, and taking, as we are bound to do in the present inquiry, the finding of the jury to be correct, it may be doubtful whether the plaintiffs can claim the verdict on this ground. But it appears to us that the use of duplicate apparatus at intermediate stations, which the jury has found to be a new invention, and which was undoubtedly used by the defendants, entitles the plaintiffs to retain their verdict. There was indeed an objection particularly applying to this part of the case, which it is proper to mention—it was intimated that the giving of duplicate signals at intermediate stations was not the proper subject of a patent, being an idea or principle only, and not a new manufacture; but we think that the patentees not only communicated the idea, or principle, that duplicate signals might be given, but showed how it might be done, that is, by duplicate apparatus at each station, and that this is the fit subject of a patent. It was, indeed, contended, that it was obvious and self-evident that a circuit having a distant coil could have intermediate ones also, which would operate in the same manner; but it appears to us, that though it might be probable *à priori* that such would be the case, it was matter of experiment that it could practically be done, and that the invention of the patentees, though simple, was one for which a patent might be granted. If, as was mentioned in the argument, the defendant has enabled the intermediate stations to send as well as to receive communications, it is a

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very important improvement, for which the inventor may probably be entitled to a patent, though he may not be entitled to use it, unless by the license of the patentee of the less perfect invention on which his own is grounded. For these reasons we think the rule must be discharged.

Rule discharged accordingly.

LIST OF IRISH PATENTS.

From May 2, to May 17, 1851.

GAETAN KOSSOVITCH, of Myddelton-square, in the county of Middlesex, Gentleman, for Improvements in rotatory engines.—Sealed May 2, 1851.—(*Six months.*)—(Communication.)

HENRY CROSLEY, of the Grove, Camberwell, in the county of Surrey, Engineer, for Certain improvements in the mode or modes, method or methods, of manufacturing raw sugar from beet-root, and in preparing such roots for that purpose, and in obtaining saccharine matters from such roots when prepared, or in a raw state, and in the machinery and apparatus, and combination or combinations thereof, applicable for that purpose, part of which modes or methods, and also part of the machinery and apparatus, with certain adjuncts and combinations, are applicable to the refining of beet and other sugar, and for other useful and manufacturing purposes.—Sealed May 6, 1851.—(*Six months.*)

JOHN GWYNNE, of Lansdowne Lodge, Notting-hill, in the county of Middlesex, Merchant, for Improvements in machinery for pumping, forcing, and exhausting of steam, fluids, and gases, and in the adaptation thereof to producing motion, to the saturation, separation, and decomposition of substances.—Sealed May 17, 1851.—(*Six months.*)—(Communication.)

LIST OF SCOTCH PATENTS.

From April 28, to May 22, 1851

THOMAS HAIMES and JOHN WEBSTER HANCOCK, of Melbourne, in the county of Derby, Manufacturers, and ALBERT THORNTON, of Leicester, Mechanic, for Improvements in

the manufacture of knit and looped fabrics, and for raising pile thereon.—Sealed April 28, 1851.—(*Six months.*)

GAETAN KOSSOVITCH, of Myddelton-square, in the county of Middlesex, Gentleman, for Improvements in rotatory steam-engines.—Sealed April 29, 1851.—(*Six months.*)—(Communication.)

JOHN BOLAND, of Norfolk-street, Strand, in the county of Middlesex, Engineer, for Certain improvements in weaving machinery.—Sealed April 30, 1851.—(*Six months.*)

EDMOND MOREWOOD, of Enfield, in the county of Middlesex, Gentleman, and GEORGE ROGERS, of the same place, Gentleman, for Improvements in the manufacture of metals, and in coating or covering metals.—Sealed April 30, 1851.—(*Six months.*)

HUGH BARCLAY, of Regent-street, in the county of Middlesex, for Improvements in the means of extracting or separating fatty and oily matters, in refining and bleaching fatty matters and oils, animal and vegetable wax and resins, and in the manufacture of candles and soap.—Sealed April 30, 1851.—(*Six months.*)

THOMAS BEALE BROWNE, of Hampton, near Andoversford, Gloucester, Gentleman, for Improvements in weaving and preparing fibrous materials, and staining or printing fabrics.—Sealed May 1, 1851.—(*Six months.*)—(Communication.)

SAMUEL JACOBS, of Highgate, Kendal, in the county of Westmoreland, Cabinet-maker, for Certain improvements in printing on woollen, cotton, paper, and other substances; parts of which improvements are applicable also to the purposes of colouring, shading, tinting, or varnishing such substances.—Sealed May 2, 1851.—(*Four months.*)

CHARLES ILES, of Bordesley Works, Birmingham, in the county of Warwick, for Improvements in manufacturing picture frames, inkstands, and other articles in dies or moulds, also in producing ornamental surfaces.—Sealed May 5, 1851.—(*Six months.*)

JOHN ALEXANDER LEROW, of Boston, United States of America, Gentleman, for Certain improvements in sewing machines.—Sealed May 9, 1851.—(*Four months.*)

FRANÇOIS MARCELLIN ARISTIDE DUMONT, of Paris, in the Republic of France, Engineer, for Improved means and electric apparatus for transmitting intelligence.—Sealed May 9, 1851.—(*Four months.*)

HENRY WIMSHURST, of Limehouse, in the county of Middlesex, Shipbuilder, for Improvements in steam-

engines, in propelling, and in the construction of ships and vessels.—Sealed May 12, 1851.—(*Six months.*)

HENRY W. ADAMS, of Boston, in the county of Suffolk, and State of Massachusetts of the United States of North America, for An improved means of generating galvanic electricity, of decomposing water or various electrolytes, of collecting hydrogen, of burning it or atmospheric air separately or in combination.—Sealed May 14, 1851.—(*Four months.*)

LIST OF ENGLISH PATENTS.

From May 3, to May 27, 1851.

WILLIAM EDWARD NEWTON, of Chancery-lane, Civil Engineer, for Improvements in the manufacture of woven and felted fabrics.—Sealed May 3, 1851.—(*Six months.*)—(Communication.)

JOHN JAMES GREENOUGH, of Washington, in the United States of America, Esquire, for Improvements in obtaining and applying motive power.—Sealed May 3, 1851.—(*Six months.*)

GAETAN KOSSOVITCH, of Myddelton-square, Gentleman, for Improvements in rotatory steam-engines.—Sealed May 3, 1851.—(*Six months.*)—(Communication.)

EDWIN ROSE, of Manchester, Lancaster, Engineer, for Certain improvements in boilers for generating steam.—Sealed May 3, 1851.—(*Six months.*)

CHARLES COWPER, of Southampton-buildings, in the county of Middlesex, for Improvements in coverings for buildings.—Sealed May 3, 1851.—(*Six months.*)—(Communication.)

PETER ARMAND LE COMTE DE FONTAINEMOREAU, of South-street, Finsbury, for Improvements in the manufacture of fuel.—Sealed May 3, 1851.—(*Six months.*)—(Communication.)

WILLIAM SMITH, of Upper Grove Cottages, Holloway, Engineer, for Improvements in locomotive and other engines, and in carriages used on railways.—Sealed May 3, 1851.—(*Six months.*)

PIERRE ARMAND LE COMTE DE FONTAINEMOREAU, of South-street, Finsbury, for Certain improvements in electric

telegraphs.—Sealed May 3, 1851.—(*Six months.*)—(Communication.)

William Cooke, of Great George-street, Westminster, Civil Engineer, for Improvements in the manufacture of soda and the carbonate thereof.—Sealed May 3, 1851.—(*Six months.*)—(Communication.)

James Pyke, of Westbourne-grove, Bayswater, for Improvements in the manufacture of leather; also, in making boots and shoes.—Sealed May 3, 1851.—(*Six months.*)

Alexis Delemer, of Radcliffe, in the county of Lancaster, Civil Engineer and Machinist, for Certain improvements in the application of colouring matter to linens, cottons, silks, woollens, and other fabrics, and to linen, cotton, silk, woollen, and other weft, and also in machinery or apparatus for those purposes.—Sealed May 6, 1851.—(*Six months.*)

William Henry Brown, of Ward's End Steel Works, near Sheffield, Steel Roller, for Certain Improvements in the manufacture of helves.—Sealed May 6, 1851.—(*Six months.*)

Thomas Robert Mellish, of Regent-street, Glass Manufacturer, for Certain improvements in instruments and apparatus for the admission and exclusion of light and air into and from buildings and carriages, and in the manufacture of reflectors of light, parts of which improvements are also applicable to the decoration of articles of furniture.—Sealed May 7, 1851.—(*Six months.*)

William Edward Newton, of Chancery-lane, in the county of Middlesex, Civil Engineer, for Improvements in apparatus for the generation and condensation of steam for various useful purposes; also improvements in certain parts of engines to be worked by steam, air, or gases.—Sealed May 8, 1851.—(*Six months.*)—(Communication.)

Harding Hallen, of Burslem, in the county of Stafford, Manufacturer, for Improvements in gas burners.—Sealed May 10, 1851.—(*Six months.*)

Emilian de Dunin, of Queen Charlotte-row, New-road, in the county of Middlesex, Gentleman, for Improvements in apparatus for measuring persons and for facilitating the fitting of garments.—Sealed May 10, 1851.—(*Six months.*)

Thomas Haimes and John Webster Hancock, of Melbourne, in the county of Derby, Manufacturers, Albert Thornton, of the same place, and James Thornton, of

Leicester, Mechanics, for Improvements in the manufacture of knit and looped fabrics, and for raising pile thereon. —Sealed May 10, 1851.—(*Six months.*)

William Longmaid, of Beaumont-square, Gentleman, for Improvements in treating ores and minerals, and in obtaining various products therefrom, certain parts of which improvements are applicable to the manufacture of alkali. —Sealed May 10, 1851.—(*Six months.*)

Charles Morey, Citizen of the United States of America, Gentleman, for Improvements in machinery for preparing, dressing, cutting, and shaping stone, and other materials made use of for building purposes, and architectural decorations.—Sealed May 10, 1851.—(*Six months.*)—(Communication.)

Edward Wilkins, of 60, Queen's-row, Walworth, in the county of Surrey, Gentleman, for Improvements in labels or tickets.—Sealed May 13, 1851.—(*Six months.*)

Edward John Carpenter, of Toft Manks, in the county of Norfolk, Esquire, Captain in Her Majesty's Navy, for Improvements in the construction of ships and vessels, and in machinery or apparatus for propelling and directing the same.—Sealed May 13, 1851.—(*Six months.*)

Luke Smith, of Littleborough, in the county of Lancaster, Mechanic, Mark Smith, of the Sun Iron Works, Heywood, in the same county, Power Loom-maker, and Matthew Smith, of Over Darwen, in the same county, Manager, for Improvements in fabrics, in weaving, and in machinery and apparatus for winding, weaving, cutting, and printing.—Sealed May 14, 1851.—(*Six months.*)

Robert Oxland and John Oxland, both of Plymouth, Chemists, for Improvements in the manufacture and refining of sugar.—Sealed May 15, 1851.—(*Six months.*)

William Hemsley, of Melbourne, in the county of Derby, Lace Manufacturer, for Improvements in the manufacture of looped fabrics.—Sealed May 15, 1851.—(*Six months.*)

Hugh Barclay, of Regent-street, in the county of Middlesex, for Improvements in the means of extracting or separating fatty and oily matters in refining and bleaching fatty matters and oils, animal and vegetable wax and resins, and in the manufacture of candles and soap.—Sealed May 19, 1851.—(*Six months.*)—(Communication.)

Perceval Moses Parsons, of Robert-street, Adelphi, Civil Engineer, for Improvements in cranes capable of being used on railways, and in parts of railways.—Sealed May 19, 1851.—(*Six months.*)

George Tate, of Bawtry, in the county of York, Gentleman, for Improvements in the construction of dwelling-houses and other buildings, including floating vessels, and for the adaptation and manufacture of materials for such uses.—Sealed May 22, 1851.—(*Six months.*)

Benjamin Bailey, of Leicester, for Improvements in the manufacture of looped fabrics.—Sealed May 23, 1851. —(*Six months.*)

James Potter, of Manchester, Cotton Spinner, an Extension of a Patent dated December 21, 1836, for the term of five years, from December 26, 1850, for Certain improvements in spinning machines.—Sealed May 27, 1851.—(*Six months.*)

Alfred Vincent Newton, of Chancery-lane, for Improvements in the carbonization of coal, and in the utilization of the products disengaged during that operation, in improving the quality of the products intended for illuminating purposes, and in regulating the flow of the same.—Sealed May 27, 1851.—(*Six months.*)—(Communication.)

Archibald Slate, of Woodside Iron Works, Worcester, for Improvements in steam-engines and steam-boilers, and in the passages and valves for the induction, eduction, and working of fluids.—Sealed May 27, 1851.—(*Six months.*)

John Fielding Empson, of Birmingham, for Improvements in the manufacture of buttons.—Sealed May 27, 1851.—(*Six months.*)

John Harrison, of Blackburn, in the county of Lancaster, for Certain improvements in the manufacture of textile fabrics, and in the preparation of yarns or threads for weaving.—Sealed May 27, 1851.—(*Six months.*)

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Macintosh, Printer, Great New-street, London.

THE REPERTORY OF PATENT INVENTIONS,

AND OTHER

Discoveries and Improvements

IN

ARTS, MANUFACTURES,

AND

AGRICULTURE;

BEING A CONTINUATION, ON AN ENLARGED PLAN,

OF THE

Repertory of Arts and Manufactures:

A WORK ORIGINALLY UNDERTAKEN IN THE YEAR 1794, AND STILL CARRIED ON, WITH A VIEW TO COLLECT, RECORD, AND BRING INTO PUBLIC NOTICE, THE USEFUL INVENTIONS OF ALL NATIONS.

ENLARGED SERIES.—VOL. XVII.

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LAW REPORTS

OF

PATENT CASES.

ELLIOTT v. ASTON.

In the Court of Common Pleas, before Mr. Justice Coltman, and a Special Jury, June 23rd, 1840.

This was an action brought by the plaintiff against the defendant for infringing a patent granted to the plaintiff on the 14th day of December, 1837, for "Improvements in the Manufacture of Covered Buttons." The declaration was in the usual form, to which the defendant pleaded, *First*, not guilty. *Second*, that the instrument in writing inrolled was as follows (setting out the whole specification *), and averred

* The specification was as follows:—

"Now know ye, that in compliance with the said proviso, I, the said William Elliott, do hereby declare the nature of my said invention, and the manner in which the same is to be performed, are fully described and ascertained in and by the following statement thereof, reference being had to the drawing hereunto annexed, and to the figures and letters marked thereon, (that is to say):—

"*Description of the Drawing.*

"My invention relates to that description of covered buttons, with flexible shanks, which are made by the aid of dies and pressure, in contradistinction to the covered buttons made by sewing the external woven fabric on to shapes by the needle. My invention having for its object to produce buttons of a more elegant description, and of a more finished character than have heretofore been manufactured, by the application of certain elegant fabrics, not hitherto employed in the making of such buttons. It may here be stated that there are several modes of making such description of buttons, differing in some degree from each other. The first is the plan known as Mr. Sanders' method, for which he obtained letters patent, bearing date the 13th day of October, 1825, but which letters patent were not sustained.

that the said Elliott did not, pursuant to the proviso in the said letters patent, by the said instrument in writing, par-

"Secondly, there is a plan which has been much pursued, and is well known as Mr. Aston's mode; and,

"Thirdly, a plan was invented by Benjamin Aingworth, for which he obtained letters patent, bearing date the 30th day of August, 1832; and I have mentioned these inventions in order to state that I do not claim the making of covered buttons, with flexible shanks, by the aid of dies and pressure, but only improvements in their manufacture; and further to state that my invention is more or less applicable to all such modes and variations of such modes of making covered buttons, with flexible shanks; my invention more particularly relating to the covering of the face, or front surface of the button, without reference to the modes of making flexible shanks, and without reference to the interior construction of the button, so long as the buttons are made by the aid of dies, or such like tools and pressure, and not covered by hand with the needle. According to the present modes of making such covered buttons with flexible shanks, the woven fabric (of which the face or front surface of the buttons has been covered) has been such, that a circular disc or portion of the cloth might be cut at any part of the woven cloth or fabric, owing to the face or front surface of the woven fabric being the same all over; hence, from whatever place a cover for a button might be cut, it would be precisely like (or so nearly like as not to be readily discovered) all other of the covers for buttons produced from any other parts of the same piece of cloth or woven fabric (mostly of silk); and although fancy weavings of silk and other materials have been used in covering such buttons, the fabrics for such covers have been such, that a circular disc or portion for covering might be taken indifferently from any part of the piece of fabric, and from whatever parts the covering of any two or more buttons might have been taken, the buttons would be precisely alike, or so nearly alike as to be sufficiently alike as to be worn side by side, without one appearing to have any irregularity of surface, not possessed by another; but till my invention, such covered buttons with flexible shanks made by pressure had not been manufactured, or made with covers of the descriptions of fabrics hereafter stated, having marked and definite designs produced in the weaving of the fabric, in the centre of each button, such invention requiring that the woven figured fabric should be so cut into disc or circular portions, and the same so worked in dies or tools, as to bring the figure or design in a central position, in respect to the face or front of the button; and further, in the act of making the buttons, not injuriously to press on the surface where the pattern, particularly in such cases where the pattern or design stands much above the ground of the woven fabric, as in the case when the design or pattern is of weavings, known as 'terry velvet,' that is, where certain of the threads of the warp in weaving (to produce the pattern), have wires laid in (when the warp is open), which wires are withdrawn, leaving small loops which stand above the surface of the ground-work of the fabric, a height depending on the thickness of the draw-wires used; and it is well known that according to this system of weaving the greatest possible variety of figures or designs may be produced on different grounds of weaving; those I prefer for the grounds on which the central designs are to be produced, are satin and tabby weavings.

ticularly describe and ascertain the nature of the said invention, and in what manner the same was to be performed,

Another sort of weaving, where it is desirable to avoid as much as possible to allow of pressure taking place at the portion of the surface of the button, where the central figure or design is situated, is that which is performed by what are called circular shuttles, or brocading shuttles, wherein there is a thick thread laid into the shed, as it is opened in the working of the loom, as is well understood, the pattern or figure produced depending on the order in which the warp threads are raised by the perforated cards, as is well understood; such fabrics having a similar appearance to those worked with needles. And I would here remark, that I lay no claim to the weaving of figured fabrics, suitable for carrying out my invention, nor do I confine myself to the use of any particular mode or modes of weaving, nor to the nature of the woven figure or design, nor to the ground or fabrics in or on which the figures or designs are woven, my invention in the first place only relating to the application of certain fabrics, having a set figure or design for the centre of each button, made by the process in weaving called terry-weaving, or of laying in threads or any description of ground by the process called brocade weaving; but although I do not claim the same, I shall hereafter give such directions and advice to the button-maker, as will enable him to give instructions to the weaver for such fabrics, with ornamental figures or devices produced therein or thereon, as will facilitate the work-people in cutting out such fabrics into coverings for buttons, and readily enable them so to cut the same, as to ensure the pattern or design coming centrally on the face of a button. The foregoing fabrics, and all other fabrics, where the central figure or design stands prominently above the ground of the fabric, require the centre of the dies should be cut away in such manner as not to press, or only very slightly to press, the raised centre or design, or ornamental figure of the button.

"There are, however, many figured fabrics, wherein the woven design, which is to constitute the central part of the button, when made according to other parts of my invention, which will not be injured by being submitted to a like degree of pressure, (throughout the surface,) to which like descriptions of buttons, when covered with a fabric, (without a central figure or design,) have heretofore been subjected, though I prefer that, whatever be the mode resorted to for making covered buttons, according to my invention, when central designs or ornamental figures are used, that the dies or tools should be so formed as to produce the requisite pressure for combining the parts, by the button being supported only or principally by the external edges or circumference of the button, because it is desirable to avoid pressing the ornamental design or figure, of whatever description of woven fabric the covering for the button may be made, and leave the pressure as much as possible to take place on the ground of the woven fabric, which comes to the outer circumference of the button.

"In addition to the modes of weaving figured fabrics above mentioned, suitable for carrying out the first parts of my invention, there are many others, as is well known, which are also suitable for the purpose of other of my improvements in making such description of covered buttons, wherein the figures or designs are made with warp

B 2

according to the true intent and meaning of the said letters patent, and which defendant was ready to verify.

threads, flushing over different numbers of weft threads, varying the pattern by the order in which the different warp threads are laid on the surface of the fabric, as is well understood; and there are other modes of weaving, wherein the figures or designs are produced with the weft threads, and some where the figure depends jointly on the surface produced by the warp and weft threads, all which are well understood in weaving, but, as before stated, I do not claim any mode of weaving, and have only called the attention of the button-maker to these matters, in order to his fully understanding the nature of my invention, and to state that my invention is not confined to the nature of the fabric, other than is hereafter and hereinbefore explained, or the peculiar movements of the loom, to obtain a fabric having ornamental figures or devices, suitable for being placed centrically on the face or front surfaces of the covered buttons aforesaid; but whatever be the nature of the fabric employed in carrying out the invention, the main object to be considered is, that there shall be patterns consisting of ornamental designs or figures, at such distances apart, as to be suitable for being cut into circular portions, each for the covering of a button, and each having an ornamental design or figure, and the whole so woven, as to allow of the fabric being cut into such portions or parts; and, further, to work up such portions or parts, that the ornamental figure or design may come truly in the centres, or so nearly the centres of the buttons, that the face or front surface of the buttons will not have a distorted appearance, in respect of the ornamental figures or designs being materially out of the correct central positions.

"This, the third part of my invention, being the application of such fabrics only, wherein the ground or face of the ground thereof is produced by a warp of soft or organzine silk, such as is used in weaving satin, and the classes of fabrics produced therefrom, which are well known, viz.,—

"Satin ground, with ornamental central figure, produced of any fibre.

Satinet	do.	do.
Twill or florentine	do.	do.
Barathe	do.	do.
Velour	do.	do.
Tabby	do.	do.
Broglio	do.	do.
Satin and Tabby	do.	do.

"Such grounds may be plain or figured, in addition to the central ornamental figure or design, for the centre of the button. Whatever be the description of woven figured fabric to be employed, care should be observed in the weaving, that the ornamental figures or designs should be only so far apart, that, in cutting up the fabric into discs, or circular portions, suitable for covers for buttons, as little waste as possible should take place, and in order to facilitate the truly cutting out of the fabrics used, I sometimes have the same woven in squares of such sizes, that the tools in cutting or stamping out a circular surface of the fabric, shall have the design or ornamental figure correctly in the centre, as is shown at fig. 1, there being in the warp of the loom

Third, that the said invention was not a new invention. The defendant also, according to the statute, filed the

yarns, *a*, *a*, *a*, of different colour to the fabric, at such distances apart as to allow of the required circle being cut; and further, in the act of weaving, a weft thread, *b*, *b*, *b*, of different colour to the fabric, is thrown in, whereby the fabric is divided into a series of squares, each square having a device or ornamental figure (such as a crown, a coronet, letters of the alphabet, such as V. R., or flowers, or other device), depending on taste, coming within the boundary line of the button, and it will be seen that in thus having the fabric woven in squares, great facility will be offered to the work-people, in cutting the same correctly into circular portions, and will thus enable them readily, by the ordinary tools heretofore used, to cut up the whole surface of the cloth. There may, however, be other modes resorted to for ensuring correctness of the cutting of the figured woven fabric, into covers for buttons; amongst others, the apparatus, fig. 2, which consists of a cylindrical stamp, *c*, capable of sliding along the pointed rod, *d*, by the use of which apparatus the work-people will be enabled with facility, correctly to cut out pieces of figured woven fabric, into circular portions, suitable for covering buttons, notwithstanding the woven fabric has not been divided into squares. In using the apparatus or tool, fig. 2, the point of the rod, *d*, is to be placed carefully on the centre of the design or ornamental figure, and then by pressing down the cylindrical stamp, *c*, (the edges of which are to be first pressed on a flannel, or other suitable surface, having a marking fluid; what I use is ground white lead, mixed with paste and milk,) a mark or circle on the fabric will be produced, having the ornamental figure or design in the centre. The fabric being thus marked, will enable the same correctly to be cut by the fly-press, or otherwise, as heretofore practised; and another mode for correctly cutting out the fabric into circular portions, is by having a sliding pointing-pin in the stamp or punch of the cutting dies of a fly-press, as is shewn at fig. 3: *e*, being the pointing pin, capable of sliding within the cutting-die or punch; *f*, the figured fabric, is stretched over the lower die, *g*, till the centre of the ornamental figure or design is touched by the point of the pointing-pin, *e*, or is coincident with it; the cut produced by the press will then correctly cut the fabric into circles, with the ornamental pattern in the centre of each circle or cover for a button. In addition to the care requisite for cutting figured fabrics correctly, there is also care to be observed in applying the covering to buttons, in the progress of making them in dies by pressure, in order to ensure the ornamental design or figure being in the centre of the button, and there may be various modes resorted to for obtaining the correctness required; one plan for accomplishing the result, is, to have the shell of metal, or internal metal lining or frame of the button, perforated in the centre, as is shewn at fig. 4, by which means a short pin or point can be passed through the centre of the circular portion of figured fabric, and then through the shell, *h*, by which means the fabric will be placed and held centrically in respect to the shell, *h*, in the die, and also during the process of combining the parts constituting the button, and the pin will be forced out by the act of pressing the parts together; by this means the correctness of cutting out of the portions of the fabric, is not so essential as the perforating the shell; and temporarily attach-

following objections:—1st, that the defendant had not infringed the patent. 2nd, that the specification did not

ing the shell and fabric together, during the process of making the button, ensures correctness, or in place of this arrangement, the dies may be suitably formed for ensuring a central position for the figure or ornamental design on the cover on the button, as is shewn at figs. 5, 6, 7, and 8. Figs. 5 and 6 being a section of a die, fig. 7, a plan of the die: and fig. 8. is a circular disc of metal, having a hole of the size of a shell, *h*, by which means the shell may be dropped through, and ensured of its central placing on the fabric below. Fig. 9, shows the die, and parts of a button, in section, and it will be seen that there is a tube, *t*, which forms the sides of the die there, in place of the die being made solid, as heretofore. In making this description of flexible shanked buttons by this arrangement, when the button is formed in the die, it can be removed from out thereof, by simply withdrawing the tube, *t*; hence the necessity of having the button forced out by a rod, as heretofore practised, is dispensed with, as it would be prejudicial in cases where the patterns producing the ornamental centre are prominent, as will readily be understood. The mode of making buttons, with flexible shanks, according to the plan shewn in the drawings, being well understood; and as all parts are shewn, and the process and apparatus differing only, inasmuch as the modes of obtaining a centering of the coverings of buttons, and the mode of constructing the dies with tubes, such as *t*, to remove the buttons, there will require no further description; and I believe that the plan shewn is the best for carrying out my invention.

"And another part of my invention relates to the application of fabrics, produced by the process of weaving, wherein draw-wires are employed, in order to raise loops of the warp threads, in such manner, as wholly to pervade the surface of the fabric, or at intervals, according to design, to produce ornamental figured weavings; such weavings, when silk is used, is called 'terry velvet,' and is well understood; but I do not confine myself to such descriptions of fabrics as have the face of silk, as woollen, or as threads or yarns, may be employed, and in this part of my invention I do not confine myself to the use of such patterns only as are suited for the ornamental centres of the buttons, but to avail myself of the use of fabrics of this description, of woven surface, whether the same be of one uniform weaving throughout the surface, or woven of such a pattern as may be cut indifferently at any part of the fabric; for it should be understood that my invention relates to, and has for its object, to manufacture buttons, having more elegant coverings than those heretofore made; and another part of my invention relates to the application of figured velvet, to the covering of such buttons as have flexible shanks, and are made by pressure in dies, or such like tools, such velvet being woven suitably with patterns or designs, either as centres to the faces of buttons, or woven with such descriptions of figures, as may be cut indifferently, for making covers for the buttons. And it is only desirable further to remark, that in cases where the pattern, or ornamental design of weaving, is such as to require care in centering, as is explained in respect to other parts of my invention, like means may be resorted to for that purpose, but where the weaving of velvet, or of terry velvet, are such as to allow of cutting indifferently in any part of the fabric,

describe the nature of the invention, inasmuch as the first five parts only set forth combinations of well-known inven-

then proper discs, or circular portions, are to be produced by a fly-press, or other convenient mode, as heretofore practised, and is well understood, in preparing like discs of other fabrics, and in making or combining the parts of a button, like processes are to be pursued as herein described, or, as have been heretofore resorted to in making such descriptions of buttons, by pressure, and the marks or polish produced by the pressure, are to be removed, and the buttons finished as heretofore.

"Having thus described the nature of my invention, and the best manner I am acquainted with for performing the same, I would remark that, I do not confine myself to the mode described for making the internal parts and back of the buttons, though I believe the mode described is the best adapted for the purpose of my invention; nor do I claim the mode described, when uncombined with a covering, according to my invention; but what I claim as my invention, is, first, the making of covered buttons, with flexible shanks, by the aid of dies and pressure, when the face or front of the button is made of any description of fabric, with raised surfaces, producing a set pattern or ornamental figure, by terry-weaving, for the centre of the button.

"Secondly, I claim the making of such covered buttons, with flexible shanks, when covered with any fabric, with ornamental set or central figures, or patterns, produced thereon, by a process called brocading, or brocade-weaving.

"Thirdly, I claim the application of such figured-woven fabrics to the covering of buttons (with flexible shanks, made by pressure in dies), as have the ground or the face of the ground woven with soft or organzine silk for the warp, when such fabrics have ornamental designs or figures for the centres of buttons, as herein described; but I do not claim the application of any figured patterns of woven fabrics, where the portions constituting the covers of buttons may be cut indiscriminately; this part of my invention relating only to such patterns as require centering, in order to bring the pattern or ornamental figure, or design, in the centre, on the face of the button.

"Fourthly, in the manufacture of covered buttons, with flexible shanks (made in dies, or such like tools, with pressure), I claim the application of such description of fabrics, as are produced by weaving, by the aid of draw-wires, which, when using silk, is called terry velvet (though woollen threads may be employed), whether such fabrics be plain or ornamental.

"Fifthly, my invention relates to the application of figured velvet in the manufacture of covered buttons, with flexible shanks, made by pressure in dies, whether the ornamental weaving be such as to be cut indifferently over the whole surface, or in set designs, for the centres of buttons.

"And lastly, in the manufacture of covered buttons, with flexible shanks; I claim the application of the modes and instruments described in figs. 2, 3, 4, 5, 6, 7, 8, and 9, for ensuring correctness of cutting out of the portions of the fabrics, in order to the pattern being in the centre thereof, and also the modes of ensuring a central placing and holding of the fabric, in the die, in making the button, and also temporarily connecting the shell, *h*, or internal part, with the portion

tions, not sufficient to constitute the subject of any patent; and the sixth part of the specification did not point out what was claimed. 3rd, that the said invention, at the time of granting the letters patent, was not new in England.

Sir F. Pollock, *Mr. V. Richards*, and *Mr. Montague Smith*, appeared for the plaintiff; *Mr. Sergeant Bompas*, and *Mr. Rotch*, for the defendant.

Mr. M. Smith opened the pleadings; and *Sir F. Pollock* addressed the Court and jury as follows:—I have the honour to appear before you on behalf of the plaintiff, and it will be my duty as shortly, and at the same time as clearly as I can, to bring under your notice the claim that he makes, and the sort of resistance he expects. Gentlemen, I dare say you are aware that, formerly, buttons were covered merely by folding over a piece of metal with a shank to it a piece of cloth or velvet. Gentlemen, after this, another kind of covered button arose, in which a circular mould, as it is called, sometimes of horn or bone, and sometimes of metal was used, for the purpose of being covered over, and thus making the button. Subsequently to that discovery, covered buttons, made by dies and pressure, of an extremely neat and elegant form, came very much into use, and were so much admired that it became a matter of importance to extend that branch of the trade; and it occurred to the plaintiff, that if central patterns could be introduced on the surfaces of such buttons, the probability was that it would immediately catch the taste of the world, and that persons would be induced to bring them into much more general use than the plain button had been. There is another class of buttons, where the face of the covering fabrics stand much in relief, and which will not bear pressure without injury, and it is to these two points of the manufacture of buttons to which the plaintiff's patent relates. Gentlemen, for the purpose of covering buttons in this way, without waste, it occurred to the plaintiff that it would be desirable to weave certain stuffs for the express purpose, so as to have small patterns for the centres of buttons, and capable of being cut, as you will by and by see; but to the manufacture of this article in itself he lays no particular

of fabric, whatever be the description of fabric on which a set pattern or ornamental figure or design may be produced.—In witness whereof, &c.

"WILLIAM ELLIOTT."

claim. There is no doubt whatever that fabrics very similar to these have been manufactured, but never before for the purpose of making buttons in the way in which the plaintiff makes them. He, however, lays no claim whatever to these fabrics *per se*, but he draws your attention to the subject by saying, the first thing I do is to weave the article, in such a manner as to be capable of being cut into proper pieces, which are afterwards to be applied to manufactured buttons. (The Learned Counsel, by the use of the dies and pressure as described, produced a button in the first stage of manufacture, and handed it to the jury.) Gentlemen, that is only the first stage of the process; that is what they call gathering it together. Understand, gentlemen, our patent is not for doing this; it is for using this process of dies and pressure in such a manner as to produce these central patterns on buttons in a state of perfection, suitable for the market. Now, gentlemen, I will conduct the process through the next stage; the pin having performed its office, and the former part of the operation having secured the pattern perfectly in the centre, the button receives a sharp pressure in dies, which completes the button.

Now, gentlemen, the two points that are attained in the process you have seen me go through, are these,—you will first observe that the pattern is perfectly in the centre; and the next point I will call your attention to is this, that the surface, although strongly pressed on, has not been in the slightest degree injured as to the raised surface of the pattern. Gentlemen, there were other modes that had been adopted in former times for the purpose of producing the same effect, but they so entirely failed, that the articles never came into use at all; perhaps I ought to say it was a mere abortive attempt. Now, I believe I have the only model that was made in the endeavour to produce an effect like this; you see that the buttons produced by it, are entirely deficient in this important matter, that the pattern is not in the centre, and the pattern is injured by the pressure. The object was to obtain articles which should be fit for use, which should be perfectly central with respect to the centre patterns, and which should be made of a material perfectly uninjured by the process of dies and pressure. Gentlemen, I believe these may be considered as the two important points which it was the aim of the plaintiff to bring to perfection, and to make the foundation of a patent such as

would be supported by his Lordship in point of law, and if novel and useful, will be supported by you in point of fact. With respect to the novelty, there can be no doubt about it, as far as my instructions go. With respect to the utility,—the general demand for buttons of this description, the large extent of the trade, and the rivalry it has provoked, are the best proofs that the invention is useful. (The Learned Gentleman then proceeded to read the specification, commenting at great length on the different processes, and shewing the processes and explaining the points claimed under the patent.) Gentlemen, I have read the whole of the specification, and I think it is now merely necessary to point out to you what are the two objects of the invention, speaking of it purposely in the shortest possible way. The first is to obtain ornamental buttons with central devices, and to secure that those devices shall be absolutely in the centre of the button, without which, every body must know that the article never could be acceptable to the public. The other is to apply to the covering of covered buttons, made by dies and pressure, certain fabrics which had never before been so applied, but fabrics which it was extremely desirable to have applied, from their beauty, from their gay and lively appearance, or the appearance of dress and richness which they might have; to produce these articles which had before been made by hand without difficulty, but which, before this, had never been made by dies and pressure. These, gentlemen, are the two points I explained to you before I read the specification, and having explained to you what were these two points, and the manner in which they arose, I will now call your attention to the pleadings, and the points which you will have to decide.

Gentlemen, the moment these articles were produced in the market, there was a very extensive and rapid demand for them. Buttons have been applied to a variety of purposes, to which they had not been before; I believe they have been much more used by ladies for different purposes than they ever were before, and they have generally become an article not merely required in this country, but in other parts of the world. As a new discovery always gives an impulse to trade, so, gentlemen, these buttons became so fashionable, that they were imitated repeatedly, and in a very ingenious and peculiar manner, and in a way certainly to which ours are not applicable, and to purposes for which

ours are not intended. But, gentlemen, we lay no claim of course to the article which I am now about to show you. (The Learned Gentleman then shewed several buttons made of horn, in imitation of silk buttons made according to the patent.) There are several of these which are imitations, one might almost say copies, of the plaintiff's buttons; at a distance you might almost take those buttons as having been prepared by the plaintiff, but they are not so prepared. Gentlemen, I mention this only to show how it constantly happens, that when an impulse is given to trade in one direction, it receives not merely that impulse, but other advantages arise from it, which are perceived and become valuable, and trade is thus benefited in a degree that was not anticipated. Now, gentlemen, I will state to you what are the issues in this case. The defendant says, first of all, that he is not guilty. We went to his shop, and we bought some articles; I do not mean to say that they professed to be of our manufacture, but they professed to be the same description of button; and when they came to be examined, nobody could doubt but that they were made in imitation of, and by the process adopted by the plaintiff. Gentlemen, the next question or plea is, that the specification is not sufficient. It is this, gentlemen, "That the said William Elliott did not in pursuance of the said proviso, and of the said letters patent, by the said instrument in writing under his hand and seal, particularly describe and ascertain the nature of his said invention, and in what manner the same was to be performed." Gentlemen, that is partly a question of law, and partly a question of fact; and I do not propose to argue it now, unless I knew what were the points to be argued. To adopt, gentlemen, what I think is an exceedingly good practical maxim, I do not pledge myself to do anything, until I know what it is necessary for me to do. Therefore, gentlemen, until I know the course which my Learned Friend is about to adopt, I shall not say anything on that part of the case. The third plea is, gentlemen, that the invention is not a new one. Now, gentlemen, I believe that in all these matters, the safest course will be to inquire, when it was that the article in question came into general, public, and extensive use. If you find that a general public use followed upon the patent of the plaintiff, and his diffusion to the world of that article which he claims to be the inventor of, I think the only safe conclusion you can come to, is that the invention is the plaintiff's. I believe, gentle-

men, according to my instructions, and of course I state it from no personal belief of my own—I should think that very indecorous; but according to my instructions there never was in the market of London, or any other button market, an article like that which the plaintiff produced until he brought it to light; those are my instructions. If my Learned Friend has any semblance of a case on the other side affecting that point, I shall deal with it when he sets it up; but I dare say you are aware that nothing is more common than for different persons in different places to be aiming at some discovery or invention, and for one person to bring his design to the point of practical improvement whilst others have been working but stopped short of that point; and then, when the public sanction is given, when a patent has been obtained, when notoriety and publicity have confirmed the grant of the Crown, and the party is in the just enjoyment of the fruits of his ingenuity and industry, then steps out somebody, and says, "Oh, dear, this is not new; I have done this; I have done that; part of it was done by A. B. There was something else that Mr. Y. Z. was doing, something a little like it here and there. The question is, who first enabled the public to have the use of the article, which is the subject of the patent? There are plenty of instances, gentlemen; the history of patents renders one familiar with cases, where *all but* the thing has been over and over again done by other persons. But it is always a case of "all but." There are a number of instances; I recollect the case of an iron wheel, similar to the ones you now see about the streets.* I remember being in that cause, and there was set up, as opposed to it, an instance of a gentleman who had wheels to a truck and to a cart made of iron, and another man who had a cart somewhere in the west, no matter where, made upon a principle that was a good deal like that at first sight, but the observation made on that was, did either of those persons produce the result? did they produce the article at a certain price, lasting a considerable time beyond the ordinary wheel?—why, the answer would be obviously this—the proof of the pudding was in the eating. There they were; they themselves who used those things never made another, and when the particular article that was supposed to be the original invention in each case was done with, it was laid by, and actually had to be produced out of some old musty

* *Jones* v. *Pearce*, vol. i., p. 524.

repository, for the purpose of being set up here in this very court, I believe, as a piece of evidence to destroy the claim of the plaintiff. Why the very case was *felo de se.* Did you ever make another? No. Why? Because the first did not succeed. But now you find some one has brought the matter to bear, and rendered it perfect, made it practical and successful, useful and general, then you come forward and say, "Oh, dear, this is my invention." Gentlemen, I am not aware that my Learned Friend can have even that ragged sort of case; whatever it is I shall be prepared to meet it. But I believe these are the only points you will have to decide. The utility is not questioned. That the public approve of these things, and are ready to use them to a considerable extent, there is no doubt. You will have to say first, in the order in which they come: Is the plaintiff the inventor of this description of articles, calculated as it is to gratify taste, and thereby to improve trade and manufacture, and to increase it and enlarge it? Secondly, Has he, by his specification, correctly put the public in possession of the mode in which he operates, so that his knowledge shall at the end of fourteen years become the property of the public, and enable them to do what he has done? And then, thirdly, Has the defendant, before the expiration of the term of the letters patent—has he pirated, in whole or in part—has he imitated any portion of the invention? if he has, and if all these matters are made out to your satisfaction, the plaintiff will be entitled to your verdict.

Mr. William Carpmael sworn, examined by *Sir F. Pollock.*—I am a Civil Engineer. I have been acquainted with the button trade a long time. The first description of die-made covered button that I remember, was that of Sanders's Florentine button. It was made with dies and pressure; there was a plate of metal which formed the shape for the face, and there was some paper and what was called a toothed-collet used; this collet was jagged all around, so that, when forced in by the dies, the serrated or saw-like edge was caused to be clenched thereby, against the internal plate, thereby holding the parts together. I never saw or heard of a covered button, previous to Mr. Elliott's patent, with a central figure made by dies and pressure; buttons with central patterns have been made before, but it has been by sewing a piece of silk or cloth over a mould. I never heard, previous to Mr. Elliott's patent, of any buttons made with velvet, or all-over patterns, made by dies and pressure.

The first point of invention claimed by Mr. Elliott, is the making of certain descriptions of fabrics having centre devices or designs into buttons, by means of dies and pressure, so as to retain the ornamental figure in the centre of the button, and not to destroy the face of it, particularly that part which is raised forming the central pattern. The other point of invention is the making of buttons from a certain description of raised fabric called terry velvet, and what is called cut velvet, by dies and pressure, so as not to destroy the face. I have read the specification, it fully describes the whole process, even the weaving of the fabrics with the centre pattern; and no workman of competent skill could fail in producing the invention if he pursued the specification. The mode of getting the centre is new. The manner in which the surface of the raised parts of the centres (where the centre is raised), and the surface of the velvets, either terry velvets or cut velvet, which are all-over patterns, is obtained, is, by the pressure being on the outer ring or circumference, in place of all over the surface, which is also new.

Mr. Justice Coltman.—You never heard of such a mode before, of preserving the raised figure.

Witness.—No, my Lord.

Sir F. Pollock.—What is organzine?

Witness.—Organzine is a peculiar class of silk, it is the silkworm's silk in a peculiar state of twist; each fibre is twisted, and then two or three of such twisted fibres are twisted into what may be called a thread.

Sir F. Pollock.—What is twist or sewings?

Witness.—The mode of making twist or sewings, is to take several of the fibres of the silkworm's silk, and twist them, and then take two, three, or more such threads, and twist them together, there is no twisting of the separate fibres. It may be said that one is the rope or cable made of strands, whilst the other is only the strands in addition to the circumstance of separate fibres not being twisted, when making "twist" or "sewings." It is from organzine that all the finer fabrics of silks are made, the twists or sewings are not suitable for such fabrics. The mode of sinking the dies, described in the specification, is the cause of the fine fabrics not being injured, the required pressure for making buttons taking place on the circumference, in place of all over the face of the button, which latter used to be the practice.

Sir F. Pollock.—If your Lordship wishes to see a button made, better than I could do, Mr. Carpmael will show you the process.

Mr. Justice Coltman.—That will not be necessary.

By Sir F. Pollock.—The patent is applicable to the different sorts of stuffs that are mentioned in the specification. I have examined the buttons manufactured by the defendant, they are a decided imitation of the plaintiff's.

Cross-examined by *Mr. Sergeant Bompas.*—I think the first buttons made on the plan of Mr. Elliott's invention, were shown to me by that gentleman about the time he commenced taking out his patent. Dies and pressure had been used previous to Mr. Elliott's patent for manufacturing covered buttons; silks with centre patterns and velvets had also been used for covering buttons with the needle. The specification describes that the centre of the dies should be cut away, in such manner as not to press, or only very slightly to press, the raised centre, or design, or ornamental figure of the button. I never heard of the dies having been before cut away at all; buttons used to be made by pressure all over the surface; it was not supposed that sufficient pressure to form a button could be otherwise obtained. The cutting of the dies is not claimed as any part of the patent, but is only referable to producing the new manufacture; it is a practical direction to point out how the invention should be carried into effect. (Some buttons were handed to witness.) These buttons are not patent buttons, they are not made by dies and pressure, they are made with the needle, some of them if made by dies and pressure would be an infringement of the patent.

Mr. Justice Coltman.—If Mr. Aston's had been so made as not to crush them, would they have come within the patent?

Witness.—Yes, my lord.

Mr. Sergeant Bompas.—Silk and velvets, with and without patterns, had been used with a needle before, to cover buttons?

Witness.—I believe so; I have not any positive knowledge of that.

Mr. Sergeant Bompas.—Probably you may have seen things of that kind? (handing several buttons to the witness.)

Witness.—I do not remember ever to have seen any-

thing of that kind previous to the patent; this is the first time I ever saw buttons of this description made by the needle, except this lower one.

Mr. Sergeant Bompas.—We are talking of your great knowledge and experience. I want to know whether, in the course of your great knowledge and experience, you will venture to say you never saw buttons of this description before?

Witness.—Speaking of the first four rows, I never saw such buttons as those till to-day, to my knowledge.

Mr. Sergeant Bompas.—The lower ones have you seen? (pointing to B 1).

Witness.—Similar to the lower ones I have seen for many years, except the two lower ones, that is, the fifth and sixth row, and this frog.

Mr. Sergeant Bompas.—You were asked about the specification, and what it meant; do you see here in this place the hollow bit of button (referring to the drawing)?

Witness.—No; it is described in the body of the specification. You cannot make such nice lines; I dare say the drawings are correct; I have never measured them.

Mr. Sergeant Bompas.—The surface of the button is downwards when it is being made; does that show any interval between the die and the button?

Witness.—No.

Mr. Sergeant Bompas.—Do you mean to say it could not be shewn?

Witness.—The interval would be very small; it could be shewn, if they were making with terry weaving or velvet weaving; but it would not require it, if it were satin.

Mr. Justice Coltman.—It does not show any interval between?

Witness.—No, my lord; not between the under surface of the button and the upper surface of the die; it shows a very good diagram of the mode by which the parts come together.

Mr. Sergeant Bompas.—I understand you to say it might have been shewn, but it was not necessary when you use satin.

Witness.—In some cases it is described as necessary, and in others it is not necessary; and it is so said in the specification.

THE

REPERTORY

OF

PATENT INVENTIONS.

No. 3. Vol. XVI. ENLARGED SERIES.—SEPTEMBER, 1850.

Specification of the Patent granted to Albert Dummler, *of Mark-lane, in the city of London, Merchant, for Improvements in obtaining Fibres from Textile Plants.* —Sealed January 31, 1850.

WITH AN ENGRAVING.

To all to whom these presents shall come, &c., &c.—The invention consists of means of extracting the fibres from textile plants by submitting them to a rotary friction between toothed surfaces parallel to the direction of the fibres contained in these plants. And I would remark that in the drawings similar letters are used for similar parts in the different figures. By the employment of mechanical means, to be afterwards described, I separate without any chemical aid the woody and the pulpy parts of the filaments which cover and which are also within the plants; and the character of the invention is, the giving motion to horizontal and circular toothed surfaces, which movement may be either continuous, rotary, or to and fro: one of these surfaces is to be moved at a varying speed, and the other surface fixed; or, if moved, to be moved in a contrary direction between their teeth. The plant to be treated is to be placed in the machine

in such manner that the teeth act at the same time upon all parts as a press, and the woody parts which are interposed amongst the fibres are broken, and each fibre is shaved transversely of the pulp which it contains. The machinery heretofore employed for triturating plants has consisted of graters, stampers, or rollers, or with teeth, but always acting perpendicularly to the direction of the filaments; the size, and distance at which the horizontal teeth are apart used by me will vary according to the tenuity of the plant to be treated, of the fibres contained. and of the quantity of pulpy, or the woody parts which it contains.

As an illustration I will first describe an arrangement of machine which may be worked by hand. And I would remark that I prefer to operate upon the banana, although my invention is applicable to other textile plants.

Drawing, fig. 1, shows the mechanical arrangement for extracting the fibres from the plants; A and C, are two plates having their surfaces serrated, forming a slight angle; attached to the upper plate are two handles by which a to and fro movement is to be given by the hands of the workman, the under plate, *c*, being fixed. For the sake of illustration we will suppose that we are operating upon the banana plant, which is to be cut into strips after the head and root of the tree is removed, and these strips are to be placed parallel to the teeth between the plates, and the movement given by the workman to the upper plate is sufficient to separate the fibres from the pulpy parts.

By this process a workman may obtain five or six pounds of fibres, in a state to be spun, per day, and it may be left in this state, or it may be separated whilst in a damp state into different qualities. The same system will be used with other description of plants.

Fig. 2, shows another arrangement in which the movement is to and fro, by which a greater amount of products may be obtained. A, is the moveable plate, and B, the fixed one; the teeth of these plates are the same as those in fig. 1. H, is a groove in which slides a roller, C, which holds on each side the two plates, the one over the other, so that the teeth may pass without re-acting. D, is a weight which acts upon the plate, A, and accelerates its movement, when by means of the handle, E, the workman passes it through the space from a^1 to b^1. The strips of

plants are placed upon the lower plate, as in the other machine, and in a few moments are rolled, pressed, and broken, the plants being pressed longitudinally between the teeth; at each movement one tooth of the rolling surface rises upon the corresponding tooth of the under plate, and thus will the fibrous matter between them be broken by the weight of the upper roller; the upper parts of the teeth tear the teguments which bind the fibres, amongst themselves, and the tops of the teeth turn the fibres by a rotary movement.

Fig. 3, shows another arrangement of machinery, which is intended to be moved by manual labour. This machine is so arranged that the plant to be treated may be supplied and acted upon by continuous pressure, and may be kept supplied without stopping the machine, and it is composed of a cylinder, A, the surface of which is serrated, and there is another surface, B, which extends over three quarters of the circumference of the cylinder. The plant to be operated upon is introduced between these two surfaces at the place where the arrow is shown, and there is also another arrow to indicate at what part of the machine it is removed. B, is the fixed toothed surface, not acted on in the rotary movement of the cylinder, but sufficiently flexible to yield when the matters are passing between the teeth. The construction of this part B, is composed of a serrated plate, having spaces left between the teeth for the passage of the juice that may come from the plants, and it is bolted to the part *c*, which is sufficiently flexible to allow of the passage of the strips of the plants when it is submitted to the action of the teeth, in a similar manner to that before described of other machinery. H and H^1, are rods attached to the part, *c*, at each end of the rod; H, is a hook which receives a cord or chain which passes over a pulley, K, which pulley turns upon the rod, H^1. L, is a weight suspended to the end of the cord, and which draws down the upper part, B, and closes at the same time the lower part; L^1, L^1, are weights attached to cords or chains which are hooked under the piece, B, at *x*, passing over the pulleys, F^1, and closing the lower part of the piece, B, against the cylinder, A, and so relieving and distributing the pressure. I, is a small board, which is always kept in a perpendicular position by means of the springs, S. When the matters

are too thick to pass between the teeth this board is moved, which causes it to take in the strips of the plants. G, are two fly-wheels. V, V, are two uprights, resting upon the blocks, M, upon which the machine is placed when required to be put into operation. O, is the handle, by turning which motion is given to the cylinder, as will be readily understood by examining the drawings. The machines which have been described are those which are capable of being worked by hand; but I will now describe those which are intended to be worked by steam or other power, by which a greater quantity of produce may be obtained; and here, before giving a description of the machine, it will be as well to explain that there is a difference which exists in the nature or character of the different textile plants; for it will be evident that the arrangement of the machines cannot be the same when treating the banana, the gravity of which is forty or sixty pounds, and which is found in abundance in the colonies, and the palm found in Africa; but the machinery now to be described is more particularly intended to operate upon the banana plant, and the plant is always introduced to the serrated surfaces with the fibres parallel to the teeth. The branches may be treated whole, or divided in two parts if there should be much gummy matter in them, in order that it may be the more readily extracted.

Fig. 4, shows a cross section; and,

Fig. 5, an elevation of a machine constructed according to this invention. A, is a cylinder having toothed or serrated surfaces, and which is near the height of the tree to be cut, and the head removed. The part, B, is also toothed or serrated, divided into parts which are fixed, and parts which are moveable, but which do not revolve with the cylinder, A, as described in the preceding machines. The moveable part, C, is about one-third of the surface of the piece, B; the largest teeth are at the entry, and are reduced up to the point of departure. The point of entry and departure of the material is indicated by the arrows. The piece, B, which is apart from the cylinder, A, at the entry, approaches progressively up to the point where the part, C, commences; then the teeth would be in contact if they would not slide over a turned part, N, of the cylinder,

which allows the teeth to move without taking into each other.

This moveable part of the piece, B, is composed of toothed plates or surfaces similar to those described in the hand-machine attached to the iron-piece, C[1], one end of which rolls upon the axis, F, and the other end upon the rod, H, where it will be seen there is a cord or chain which passes over a pulley, K, and to the end of the cord is suspended the weight, L, which brings back the moveable piece, C, over the cylinder. The banana is to be placed upon the piece, M, which is an inclined plane, and from thence is passed between the teeth of the cylinder and the piece, B. E, is a wedge-piece, which extends the whole length of the cylinder, and to which are attached spiral springs, E', and guides, *e*; this piece is drawn down upon the banana (already introduced between the teeth) by a flexible cam, F, attached to the cylinder, which causes it to enter between the teeth, and then by the action of the spring it is raised again; at each revolution of the cylinder the cam acts upon the wedge-piece, E, to aid in forcing between the teeth a fresh portion of the banana. This machine is mounted upon two pieces of wood, which are firmly fixed to the masonry, so as to give a solidity, and it is preferable to place the machine across a canal. I, are two metal cross-pieces to which the piece is bolted, as shown. To facilitate the labour of separating the filaments and the pulp, water is of great assistance with the greater part of the textile plants. A pump may be so arranged and worked by the power of the engine, and caused to throw water constantly upon the cylinder, and this water will carry away into the canal under the machine the pulpy matter which may accumulate in the lower reservoir, O, and these matters may be afterwards withdrawn, and dried in the open air, and will be found to be useful as a fuel.— In witness, &c.

ALBERT DUMMLER.

Enrolled July 31, 1850.

Specification of the Patent granted to MACGREGOR LAIRD, *of Birkenhead, Gentleman, for Improvements in the Construction of Metallic Ships or Vessels, and in Materials for Coating the Bottoms of Iron Ships or Vessels, and in Steering Ships or Vessels.*—Sealed January 19, 1850.

WITH AN ENGRAVING.

To all to whom these presents shall come, &c., &c.—My invention consists of improvements in constructing ships and other vessels of sheets of corrugated metal, and in applying hollow trough-like sheet metal for frames or parts of frames of ships or vessels constructed of sheet metal.

Secondly, my invention consists of building metal vessels or boats in sections with internal flanches, and also so as with facility to arrange more or less of such sections into a larger or smaller boat, according to the number of sections at any time used.

Thirdly, my invention consists of coating decks of ships or vessels formed or partly formed of metal with asphalte; and,

Fourthly, my invention consists of improvements in the construction of metal vessels or boats to render the same more suitable for carrying oil, grain, or other matters in bulk.

And in order that my invention may be most fully understood and readily carried into effect, I will proceed to describe the means pursued by me.

I would state in respect to the first part of my invention, that it has before been proposed to employ corrugated metal in the construction of ships and other vessels in order to obtain the greater stiffness of metal. In one case the corrugated metal was sheathed externally with flat or plain sheet metal, in order that the sides of the ships or vessels when so using corrugated metal should be flush; and another mode which has heretofore been proposed has been to make boats or such-like vessels by causing the sheets of metal to be bent in concave and convex moulds, in such manner that the act of

bending or corrugating from a flat surface to the contour of the vessel or part of a vessel should take up those parts of the metal not necessary to the contour of the boat or vessel, in which latter case the corrugations would not be regular at different parts. Now, according to my invention, I employ corrugated metal for the external surfaces of ships or vessels, causing the corrugations to run longitudinally at the sides of the ships or vessels in a direction from stem to stern. In constructing ships or vessels according to this part of my invention, the frames, when any are used, may be made with angle iron or other bars, as heretofore, and the plates of corrugated iron may be caused to form butt or lap-joints, as when using plain or flat sheets of metal, the corrugations in the several sheets where they come together being similar in form and distance apart; and in order to employ sheets with like corrugations from stem to stern of a boat or vessel, as the plates approach the stem or stern I cause the edges of the plates to be cut off, in which case the size and form of corrugation will be the same from end to end of a boat or vessel, or in place thereof I can cause the plates to be formed by hammering them on or into a mould or by rollers, so as to produce corrugations in such manner as to cause them to decrease regularly from the widest corrugation up to nothing at the bow; and I also in like manner prepare plates with corrugations as they approach the stern, the object being to obtain lightness, with great stiffness of construction, and more cheaply and readily than when employing corrugated plates, every part of the corrugations of which differs from all other parts thereof, by using concave and convex moulds for every form of boat or vessel, and for every form of corrugation required; and which convex and concave moulds heretofore have been considered necessary for the preparation of sheets of metal for every part of a vessel's sides, when building boats or vessels formed externally of corrugated metal; whereas, according to this part of my invention plates of ordinary corrugated metal, wherein the corrugations are similar in form and parallel to each other, may run from stem to stern of a vessel, or such corrugated plates of metal may for the most part be used, the stem and stern only having plates corrugated, with tapering corrugations regularly decreasing near the stem and stern of a

vessel, from the largest form of corrugation used at the sides, to no corrugations at the stem or stern.

And another improvement in building metal ships or vessels consists of employing as framing hollow sheet-metal, to obtain stiffness with lightness. For this purpose, supposing I wish to give strength to a ship or vessel (constructed of ordinary sheet-metal) in a direction fore and aft, then I employ, either externally or internally, sheet-metal frames, each bent into a hollow or trough-like form, with flanches on either side, and I fix such trough-like framings at intervals apart by riveting them to the sheet-metal sides, so that they will appear when outside of a ship or vessel like so many projecting convex streaks running fore and aft of the ship or vessel; or the same may be fixed on the interior of the sheet-metal sides, or such hollow framings may be used inside in place of angle-iron or other bars, and constitute the main framing of the vessel, and leave the sheets of metal riveted thereto. By this arrangement, in addition to the advantage of obtaining great stiffness and stability with lightness, as the spaces between the sheet-metal sides and the hollow framing will be inclosed, they will therefore aid in buoying up the ship or vessel. I would state in respect to metal ship-building that I believe in most cases it is advantageous to employ sheet-iron covered with zinc.

In regard to the second part of my invention I would state:—Many iron vessels have been constructed in this country and sent out in parts, to India and other places, but such parts have had to be put together by riveting the ends of the plate of which the parts are composed, hence requiring skilled workmen to be sent out to put the parts together. Now, according to this part of my invention, I build boats or vessels in sections with internal flanches, in such manner that they may go together by screw-bolts and nuts, or otherwise, so that common or unskilled labour may be employed abroad to put the parts together. And this part of my invention also consists of building boats or vessels in sections or parts, each part having two bulk-heads or ends, and in such manner that more or less of such sections may be used in composing a boat at any time, depending on the service such a boat might, for the time being, be required to be employed on.

Description of the Drawings.

Fig. 1, shows the plan of a boat.

Fig. 2, a longitudinal section thereof.

Fig. 3, shows a section taken at A, A; and

Fig. 4, another section on a larger scale.

This boat or vessel is made in eight sections, but the number of sections of which a boat or vessel may be composed may be varied. The internal flanches are to be prepared with corresponding holes for receiving screw-bolts, which I believe will be found the most convenient means of putting such sections together, using vulcanized India rubber or other suitable matter at the joints, to make them water-tight when drawn together by screw-bolts and nuts. By this mode of building metal vessels or boats the same may be in section, which will admit of close stowage, and may be readily transported and great expense saved, as the most ordinary labour will be sufficient to put the parts together.

Fig. 5, shows a plan; and

Fig. 6, a section of a steam-boat or other vessel, consisting of eleven sections or parts, (which number may, however, be varied,) each part or section having a bulk-head or flanch, and these come together, and are joined by screws and nuts.

Fig. 7, shows a side view of a boat constructed of two sections.

Fig. 8, shows a longitudinal section of the same boat, having between the stem and stern sections, or parts, two midship sections, or parts of a boat introduced, which are shown separately at fig. 9; and more or less midship sections or parts may be introduced according to the service in which such a boat or vessel may be about to be employed, the size of the boat being readily changed from time to time according to the requirement for the time being. Each section or part of the boat or vessel is to be formed with bulk-heads or ends, with convenience for connecting the same by screws and nuts, or other suitable means of connexion. By this part of my invention emigrant and other ships may carry boats of very large dimensions, and yet allow of ready stowage by reason of the same being readily taken to pieces.

I will now describe the third part of my invention, which consists of rendering a deck of a ship or vessel

made of iron flush by means of asphalte. I prefer in carrying out this part of my invention to form the decks with corrugated iron; and I fill the corrugations and render the whole flush with asphalte; and such is also the case with regard to decks made with sheets of uncorrugated metal.

I will now describe the fourth part of my invention.

Fig. 10, shows a plan; and,

Fig. 11, a section, of what I call a tank-ship, for carrying oil or grain or other matter in bulk more safely and conveniently, and consists in building such metal ships or vessels with longitudinal close or tight bulk-heads upon the line of the keel to give longitudinal stiffness to the vessel, and it prevents the cargo shifting; and I build such vessels with several transverse bulk-heads, by which a vessel would be divided, as it were, into numerous tanks, or separate vessels or chambers, which may have communication with each other, such as by man-holes or otherwise, readily capable of being closed.

Having thus described the nature of my invention, and the manner in which the same is to be performed, I would have it understood that I do not confine myself to the details as herein described.

But what I claim are,

The improved means of constructing ships or vessels by employing corrugated metal, as herein explained; and also the employment of hollow sheet-metal framing as explained.

Secondly, I claim the building of metal vessels or boats in section with internal flanches; and also so as with facility to arrange more or less sections into larger or smaller boats or vessels.

Thirdly, I claim the coating decks of vessels made or partly made of metal with asphalte; and,

Fourthly, I claim the improvements herein described in respect to building ships or vessels with longitudinal and transverse bulk-heads, to facilitate the carrying cargo in bulk.

MACGREGOR LAIRD.

DISCLAIMER.

In the matter of a patent granted to Macgregor Laird, of Birkenhead, Gentleman, for his invention of Improvements in the construction of metallic ships or

vessels, and in materials for coating the bottoms of iron ships or vessels, and in steering ships or vessels, bearing date, at Westminster, the 19th day of January, 1850.

Disclaimer proposed to be entered by the said Macgregor Laird with the Clerk of the Patents of England, pursuant to an Act passed in the fifth and sixth years of the reign of His late Majesty King William the Fourth, intituled "An Act to amend the Law touching Letters Patent for Inventions."

I, the said Macgregor Laird, do declare, that since I obtained the said Letters Patent, I have not been able in the time allowed to mature such parts of the invention, which were intended to have been described under that part of the title which is contained in the following words, "and in materials for coating the bottoms of iron ships or vessels, and in steering ships or vessels;" for which reason I am desirous and do hereby disclaim all that part of the title which is contained in the following words, "and in materials for coating the bottoms of iron ships or vessels, and in steering ships or vessels."—In witness, &c.

MACGREGOR LAIRD.

Enrolled July 19, 1850.

Specification of the Patent granted to WILLIAM HENRY PHILLIPS, *of York-terrace, Camberwell New-road, in the County of Surrey, Engineer, for Improvements in Extinguishing Fire, in the Preparation of Materials to be used for that Purpose, and Improvements to assist in Saving Life and Property.*—Sealed April 16, 1849.

WITH AN ENGRAVING.

To all to whom these presents shall come, &c., &c.—My invention consists,—

First, of improvements in apparatus used in extinguishing fire, and thereby to assist in saving life and property; and,

Secondly, my invention consists in improvements in

preparing the materials used for extinguishing fire: and in order that my invention may be most fully understood, and readily carried into effect, I will proceed to describe the means pursued by me.

Description of the Drawings.

Fig. 1, shows a section of an apparatus for evolving, when in action, gases and vapours capable of extinguishing fire, and I prefer to employ for such purpose the ingredients described in my former specification, enrolled on the 4th day of December, 1844; but the materials employed for this purpose may be varied. In my former patent I described the apparatus as being formed in such manner that the combined materials should burn upon, and the gases be evolved from, the top surface only; now I have since discovered that it is desirable that the whole of the surfaces of the mass of matters should become ignited as quickly as possible, and my present improvements, amongst other advantages, are designed to accomplish this end, and will further allow of the use of the improved apparatus, whether it be placed on its bottom, or inclined, or other position.

Fig. 2, is a horizontal section of the apparatus; and

Fig. 3, shows a means where a cap is used for discharging, in place of a globule of glass containing sulphuric acid, as shown in fig. 1. *a*, is a moulded mass of the materials employed, and which is ignited by means of a pin, *b*, when the same is driven down by a hammer or other instrument into the position shown at fig. 1, by dotted lines. The tube below contains a mixture of equal parts of chlorate of potash and sugar. The matter being ignited, the products flow through the holes in the inner vessel, *c*, *c*, into the vessel *d*, *d*, and out through the holes in that vessel into the vessel *e*, *e*, by which means the heat acting on the vessel *e*, *e*, will cause the air between the vessels *e* and *f* to expand, and the water in the vessel *f*, *f*, will be driven up the tube, *g*, *g*, which is surrounded by a handle of wood or other material, and the water will flow in at *g**, and thus the gases and vapours evolved will be brought in contact with water, and then the products will go off at the opening or passage, *h*; and supposing such an apparatus to be in a room, a cabin, or other part of a ship, or other place where there is a fire to be extinguished, immediately the appa-

ratus is in action, and the products pass off, the fire will be acted on and quickly subdued; and in cases where the apparatus cannot be readily introduced into the place where the fire is, it may (immediately on being put into action) be thrown through a window or other opening, as near to where the fire prevails as possible, and the beneficial effect will immediately follow. It will, therefore, be readily understood that apparatus thus arranged will have considerable advantage over those formerly described by me, as the present one will not require any care in being placed in a room or other place, and there will be more extensive surfaces burning at the same time than could be obtained by the former construction of my apparatus. Hence the saving of property will be rendered more easy, and the saving of life from fire be more sure.

Figs. 4, 5, 6, and 7, show sections of two arrangements of apparatus having similar advantages to that above described, but more simple in construction. In each of these the water is contained in vessels closed with a plug, readily melted or driven out. In figs. 4 and 5, the matter having been ignited in the vessel, *h*, the products will pass out at the holes in that vessel into the vessel *i*, and the heat will expand and evaporate the water in the vessel *j*, and drive out the stopper, *k*, and the water, as it is driven out, will come in contact with the products passing out at the holes in the vessel, *i*, and then the products will pass away by the outlet, *l*, into the room or other place where a fire may be raging, and the same will quickly be extinguished. In figs. 6 and 7, the products from the ignited mass, within which the vessel containing the water is placed, will descend, and the water becoming heated the plug will be driven out and the water discharged into the perforated vessel below, and the products passing from the upper to the lower part of the vessel *h*, will combine with and evaporate the water, and the products will pass through the holes and ascend within the outer vessel, *m*, and thence away through the holes and away by the passage, *n*. These two arrangements of apparatus are equally efficient, whether they stand on their bottoms or are placed or thrown so as to assume other positions.

Fig. 8, shows the section of another apparatus very similar to that at fig. 4, the principal difference being that there is in the present a separate vessel for containing the

vessel for the water, and the upper cover passes into, in place of over, the top of the apparatus.

Figs. 9 and 10, are two sections taken at different parts of fig. 8.

In some cases I find it desirable to employ the use of a steam-jet to aid the products of combustion, such steam-jet not only acting itself as a means of extinguishing fire, but also quickening the discharge of the products from burning matter, such as before mentioned, or it might be for ordinary fuel, so as the more quickly to pervade a room or other space, more quickly and cheaply with gases and products of combustion capable of extinguishing fire.

Fig. 11, shows a section of a suitable apparatus for this purpose. In this case, the products may be conveyed by a suitable pipe or hose from the apparatus into the room or other place. *o*, is the vessel or compartment into which the matter to be consumed is to be placed, which I prefer to be a composition such as before described, in which case no grating at bottom would be required; but if other fuel be used, a grating would be required to admit air to support combustion, if air be not forced in so as to pass amongst the fuel. *p*, is a vessel containing water surrounding the vessel, *o*, which vessel, *o*, is fed through a shoot with a close cover, as shown. *q*, is a steam-pipe, to produce a jet, and it is surrounded by the pipe conveying away the products of combustion, which pass in contact with water in getting into the outer vessel, *r*, as is indicated by the arrows. And in order to get a quick supply of inflammable matter, I (in addition to the burning mass in the vessel, *c*) can admit turpentine or other matter in a liquid state in a regulated stream through the pipe, s^1, from a vessel, *s*, as shown.

I would remark that air may be admitted into the chamber or compartment containing the burning materials from above, in the manner shown, and the effect of the steam-jet will be to draw off the products in the direction of the arrows through the water below the fire. When using turpentine or other liquid to aid the combustion, I cause the same to be driven in by a communication from the steam-boiler, *p*, into the vessel containing the liquid, as shown at *t*.

The second part of my invention consists of causing the combined ingredients used, such as are described in my former patent, by the aid of boiling, in place of simply

mixing them with a quantity of water, to render them plastic, and then moulding the same as formerly described by me; and for this purpose I apply to such materials about their weight of water, and subject them to heat in any suitable vessel, keeping the matters well stirred, till the boiling and heat has driven off the larger part of the water, leaving the mass in a state to be moulded, when I fill the same into moulds, when in a hot state, and press the same into the moulds, by which means I obtain the matters more equally blended, and the moulding is more advantageously performed.

Having thus described the nature of my invention, and the manner in which I perform the same, I would have it understood that what I claim is,

First, the apparatus herein described for facilitating the extinguishing of fires, and thereby aiding in saving life and property; and,

Secondly, I claim the means of preparing matters for extinguishing fires, as herein described.—In witness, &c.

WILLIAM HENRY PHILLIPS.

Enrolled October 16, 1849.

Specification of the Patent granted to FREDERICK HALE THOMSON, *of Berners-street, Oxford-street, in the County of Middlesex, and* EDWARD VARNISH, *of Kensington, in the same County, for Improvements in the Manufacture of Inkstands, Mustard-Pots, and other Vessels of Glass.*—Sealed December 19, 1849.

WITH AN ENGRAVING.

To all to whom these presents shall come, &c., &c.—Our invention consists of blowing or forming glass-vessels so as to leave hollow spaces between the sides, so that the effect of silvering will be seen interiorly and exteriorly; that is, such vessels will show the silvering through the glass, both on the exterior of the vessels and the interior of the vessels. In this manner may glass vessels be made and ornamented, applicable to a great variety of purposes, such as flower-vases, inkstands for inkglasses, brush trays, pen trays, inkglasses and covers, muffineers, smelling-bottles for silver tops and glass stoppers, toilets,

caddy basins and sugar basins, butter dishes, covers, and plates, dishes, goblets, mustards, and covers, salt cellars, mugs with hollow handles, plateaux, wine coolers, finger cups, bottle stands, cruets, linings for salvers. In order that our invention may be understood, we will explain the drawing hereunto annexed.

Fig. 1, shows a section of a glass vessel of a vase form, and in this manner may be made large and small vases. The upper part is blown and shaped double, the stem and foot are hollow, and there is a hole, *a*, at the bottom, through which the solution of silver employed for silvering is to be formed. And the solution we prefer to use for this purpose is one ounce of hartshorn or ammonia, and two ounces of nitrate of silver, three ounces of water, and three ounces of spirit, (we prefer spirits of wine); mixing these carefully together we allow the liquid to stand three or four hours, and then filter it for use. To one ounce of the filtered fluid we add a quarter of an once of saccharine matter dissolved in equal parts (say about half a pint each,) of spirit and water. We prefer grape sugar so dissolved, if the solution is allowed to stand for a few hours. It can be employed either in a horizontal or vertical position, provided the liquid be kept in contact with the surface of the glass intended to be silvered, the glass being kept heated to about 160 degs. of Fahrenheit during the process; but we make no claim to this mode of silvering glass, as the same has long been practised in England, neither do we confine ourselves thereto.

Fig. 2, shows an inkstand, which is also blown and formed double, and has a hole, *a*, at bottom for the introduction of the silvering fluid.

Fig. 3, shows a finger-glass, also blown and shaped double, having a hole at bottom, as in the former cases. In some cases the exterior and interior parts of the vessels may be separate, as shown at fig. 4, where a section of a glass vase is shown, made of the two parts, *a*, *b*, the rim being fixed together by a metal edge, or by other convenient means. When the vessels have been so shaped the same may be ornamented by cutting, as in other glass vessels, to aid in producing a greater effect of ornament. We have shown these vessels as examples, as they represent sufficiently the various classes of vessels, which may be similarly blown and shaped, and ornamented by

silvering on the interior between the double surfaces. By this means a great diversity of shaped vessels may be made, varying only in shape, but still possessing that double character, that, being silvered on the interior space the effect of the silvering will be seen through on the interior and exterior of the vessel so made, and the silver will not be touched either by the matters introduced into such vessels; neither will the silver be touched when cleaning the interior or exterior of the vessels so made and ornamented, for after the process of silvering has been performed, the remaining liquid is to be poured out, and the opening, *a*, into the hollow space is to be closed so as to protect the silver.—In witness, &c.

FREDERICK HALE THOMSON.
EDWARD VARNISH.

Enrolled June 19, 1850.

Specification of the Patent granted to ETIENNE JOSEPH HANON-VALCK, *of the Kingdom of Belgium, Miller, for Improvements in Grinding.*—Sealed January 31, 1850.

WITH AN ENGRAVING.

To all to whom these presents shall come, &c., &c.

Description of the Drawings.

Fig. 2, is the upper surface of a mill-stone, having perforations therein, as shown in section at fig. 3; and

Fig. 4, shows an underside view of the stone, on which it will be seen are formed hollow channels, into which air passes when the stone is rotating. The hollow channels have each two holes through the stone, the one to receive a funnel, A, shown separately at fig. 1, the other hole to receive a tube, D, with a cock, fig. 8, or a hooded end, fig. 7, or else a stopper, fig. 6. If the grain be very dry, the tubes, D, or some of them, are to be closed, but generally it is found desirable to have a free passage, and to use the hooded end, fig. 7. The air in the rotation of the stone is caught by the funnels, and descends down

into the hollow channels on the under surface of the stone.

I would remark, that I am aware that funnels have been used as means of causing air to pass between mill-stones; I do not, therefore, claim the same; the novelty of the invention consisting of having combined therewith channels and openings at their further ends, as explained.—In witness, &c.

ETIENNE JOSEPH HANON-VALCK.

Enrolled July 31, 1850.

Specification of the Patent granted to GEORGE EDMOND DONISTHORPE, *of Leeds, in the County of York, Manufacturer, for Improvements in Wheels of Locomotive Carriages.*—Sealed December 3, 1849.

WITH AN ENGRAVING.

To all to whom these presents shall come, &c., &c.—My invention consists of constructing the driving wheels of locomotive engines in such manner that the running surfaces thereof shall consist each of several separate and independent parts pressed outwards by elastic means, whereby a larger portion of a driving wheel will be constantly in contact with a rail, and thus may the driving wheels of locomotive engines be made more effective. And in order that my invention may be most fully understood and readily carried into effect, I will proceed to describe the means pursued by me.

Description of the Drawing.

Fig. 1, shows a side view partly in section; and

Fig. 2, a transverse section of a driving wheel for a locomotive engine constructed according to my invention, and I prefer the wheel to be of the kind known as solid or disc wheels; I do not, however, confine myself thereto, as other constructions of wheels may be used in carrying out my invention.

a, *a*, are a series of sliding blocks constituting the running surface of the wheel. These blocks are separate from and independent of each other, and they are con-

stantly pressed outwards by a belt of vulcanized india-rubber, or the means of pressing out such block may be varied, and other materials than vulcanized india-rubber may be employed. The blocks, *a*, *a*, are kept in position by bolts, *b*, passing through slots in the blocks. I would, however, state that other modes of retaining the blocks, *a*, in position may be employed. The effect of this arrangement will be that a driving wheel will bear on a rail to a much greater extent than when the running surface consists of one ring, which practically can only touch at one point or line across its surface.

Having thus described the nature of my invention, and the manner of performing the same, I would have it understood that

What I claim is,

The manufacture of the driving wheels of locomotive engines with the running surfaces, each made up of several separate and independent parts pressed outwards by suitable elastic means, and thus to obtain more extensive bearing surfaces.—In witness, &c.

GEORGE EDMOND DONISTHORPE.

Enrolled June 3, 1850.

Specification of the Patent granted to THOMAS RICHARDSON, *of the Town and County of Newcastle-upon-Tyne, Chemist, for Improvements in the Manufacture of Epsom and other Magnesian Salts, also Alum and Sulphate of Ammonia.*—Sealed January 26, 1850.

WITH AN ENGRAVING.

To all to whom these presents shall come, &c., &c.—My invention consists,

First, of employing magnesia, or baryta, or strontia, or lime, and also in employing sulphurets of potassium, sodium, ammonium, barium, strontium, calcium, or magnesium for separating the impurities from solutions of sulphate of magnesia. And this part of my invention also consists of making a double salt of sulphate of magnesia and ammonia.

Secondly, my invention consists of improvements in the manufacture of alum by the use of means hereafter

described, for exhausting calcined shale more advantageously than heretofore; and,

Thirdly, my invention consists of improvements in manufacturing sulphate of ammonia.

And in order that my invention may be most fully understood and readily carried into effect, I will proceed to describe the means pursued by me.

In carrying out the first part of my invention I take rough epsoms dissolved in water, or I obtain or prepare a solution containing impure sulphate of magnesia, and the precipitating agent I prefer should be made up into a state of cream by the admixture of water therewith, and I believe the best precipitating agent to be magnesia, and I pour the cream thereof into the solution of impure sulphate of magnesia and agitate the whole, preferring to apply heat, which I do by means of steam-pipes, until a portion of the liquid filtered from the precipitate obtained does not change on the addition of sulphuret of ammonium. The solution thus treated is then allowed to stand, and the precipitate subside; the clear liquor is drawn off, evaporated to strength, allowed to crystallize, and the process finished in the ordinary manner of making epsom salts. The precipitate is repeatedly washed with water and the liquor taken off by subsidence or filtration, until nearly the whole of the salt is obtained. By this means I not only get free epsom salts, and comparatively a large product therefrom, but I also avoid the expensive process of calcination heretofore employed.

I would remark that when acting with baryta, strontia, or lime, in order to purify solutions of impure sulphate of magnesia, I employ them in like manner to that above described when using a cream of magnesia, but as these substances combine with the sulphuric acid in the solution, and form insoluble compounds, I prefer to employ magnesia; when employing sulphurets of potassium, sodium, ammonium, barium, strontium, calcium, or magnesium, I employ solutions of these substances to precipitate the impurities contained in solutions of sulphate of magnesia, using agitation when mixing the same, and when a portion of the filtered liquor is not changed by the test above mentioned, the process is complete, and pure epsom salts are obtained by evaporation and crystallization, as before stated. It should be remarked that it is not essential that the impure sulphate of magnesia should

be in a state of solution when acting on it with the matters herein described, as a similar effect may be obtained by mixing and grinding these matters in a moist state, and then dissolving out the epsom salts. From the sulphate of magnesia obtained by any of the means above described, I make carbonate of magnesia in the ordinary manner. In making a double salt of sulphate of magnesia and ammonia, I mix a solution of impure sulphate of magnesia with gas-water, preferring to employ heat until the liquor is rendered nearly neutral. The precipitate which is formed during the process is allowed to subside, and the clear liquor boiled down to about fifty degrees or sixty-five degrees Twaddel, when it is set aside to crystallize. The salt so obtained may be employed as a manure, and in the manufacture of alum. Instead of mixing gas-water with the impure sulphate of magnesia I find it advisable in some situations first to neutralize the gas-water with sulphuric acid in the ordinary manner, and then add the equivalent quantity of rough epsoms or impure sulphate of magnesia, boiling to strength, and crystallizing in the usual way. Or I can make such double salt by employing sulphate of magnesia purified, as above described, or in its impure state, either in solution or in a damp state, and a current of ammonia procured by distilling gas-water, guano, or any other body capable of producing ammonia by destructive distillation with quick-lime. In such cases the ammoniacal-gas is to be purified by passing it through water, so that the magnesia which is obtained may be white, and suitable for the market, and when not sufficiently pure for this purpose, it will be found well adapted for use in purifying impure sulphate of magnesia by the methods already described. The liquor which holds the magnesia in suspension, and from which it is separated by subsidence or filtration, contains the double salt of sulphate of magnesia and ammonia.

I will now proceed to describe my improvements in the manufacture of alum. In lixiviating the calcined shale for the purpose of obtaining the raw alum liquor, I employ an arrangement of pits, as explained in the drawing annexed, which represents a series of pits furnished with pipes, B, B, B, for the purpose of conveying water or liquor from one to another, the pipes being stopped with taps or cocks, E. Water is run from the

service-tank, A, through the pipe, C, into No. 6, until it flows over through the pipe, B[6], and passes through pipe, D, to the bottom of the pit No. 1, through which it rises until the pit is filled, exhausting the soluble ingredients in its passage. After standing some days the supply of water is continued as before in No. 6 pit, which causes the liquor in pit No. 1 to flow down the pipe, B[1], the cock, E[1], of which has been removed or opened; the liquor then ascends through the mine or calcined shale in No. 2 pit, in the same way and for the same purpose as it did in No. 1; after standing a further period of some days, the liquor is forced through No. 3 pit by similar means; and this is repeated with successive pits, as often as the liquor man finds necessary to bring the liquor up to twenty-eight degrees Twaddel, or such higher strength as is desired, when it may be drawn off by the tap, F. As soon as the mine or calcined shale is exhausted in any one of these pits, it is removed, and replaced by a supply of fresh mine, and the process is continued as before. Of course, as the operation goes on week after week, it will become necessary to commence the supply of the water from the service-tank, A, to the different pits in succession, which may be done as above described, or by allowing it to run at once down the pipes, B, B, B, from taps in pipe, C. By the use of this arrangement of apparatus, the labour of pumping the liquor from one pit to the other will be saved, and the process of exhaustion rendered generally more convenient, and the result will be a more perfect exhaustion of the shale.

In carrying out the third part of my invention, I employ the double salt of magnesia and ammonia, obtained as described under the first part of my invention, and I cause the same to be sublimed in the way usually practised in preparing sal-ammoniac.

Having thus described the nature of my invention, and the manner in which the same is to be performed, I would have it understood that I do not confine myself to the details herein described, so long as the peculiar character of any part of my invention be retained.

But what I claim is,—

First, the improvements herein described in manufacturing epsom and other magnesian salts.

Secondly, I claim the improvements herein described in the manufacture of alum; and,

Thirdly, I claim the improvements herein described in the manufacture of sulphate of ammonia.—In witness, &c.

THOMAS RICHARDSON.

Enrolled July 26, 1850.

Specification of the Patent granted to ROBERT JOHN FAYRER, *of Surrey-street, Strand, Commander in Her Majesty's Royal Navy, for Improvements in Steering Apparatus.*—Sealed January 11, 1850.

WITH AN ENGRAVING.

To all to whom these presents shall come, &c., &c.—My invention consists of so arranging apparatus in combination with a steering wheel that the steersman may, by his foot, bring a break into action, so as to retain, or aid in retaining, the rudder in any position to which it may be brought by the steering-wheel. And in order that my invention may be most fully understood, and readily carried into effect, I will proceed to describe the means pursued by me.

Description of the Drawing.

Fig. 1, shows a front view of the steering-wheel and apparatus combined therewith, according to my invention.

Fig. 2, shows a plan; and

Fig. 3, a side view thereof.

The description of break which I prefer to employ is a metal band or strap, having a band of wood within it, and acting on a pulley or drum of wood fixed on the axis of the steering-wheel; but the forms as well as the materials of these parts, as well as of the other parts of the apparatus, may be varied without departing from my invention.

The drawing shows the parts in the position of the break being in contact, as if pressed into position by the foot of the steersman, for holding the rudder. A, is a band of metal constituting the break; B, is the band of wood which lines the metal band, and acts on the surface or pulley, C, fixed on the axis of the steering-wheel. The band of wood is in parts, to allow of the metal band opening away from the surface, C, when the break is not

required to be in action. One end of the break is fixed at G, and the other end is attached to one of the levers, E, there being an adjusting screw-coupling at D, to adjust the break.

The two levers, E, are connected together by a link, H, and the levers, E, move on axes, I, I, and in order to keep the break out of action, a weight, F, is used as shown, or it may be done by a spring or otherwise. The steering-wheel is to be used in the ordinary manner, and when the aid of the break becomes desirable, the steersman places his foot on one of the levers, E, so as to bring the brake more or less strongly into action, by which it will be found that the rudder may be retained with great certainty and with comparative ease.

The arrangement shown in the drawing is such that two steersmen may be at the wheel at the same time, and either or both be able to press the break into action as occasion may require.

Having thus described the nature of my invention, and the best means I am acquainted with for performing the same, I would remark, that I am aware that it has before been proposed to employ a break in combination with a steering-wheel, such break being brought into action by a weight, and put out of action by the foot of the steersman. I do not, therefore, claim the application of a break to a steering-wheel generally.

But what I claim is, viz.,

The so arranging of apparatus in combination with a steering-wheel, that the steersman may by his foot bring a break into action so as to retain or aid in retaining the rudder in any position to which it may be brought by the steering-wheel.—In witness, &c.

ROBERT JOHN FAYRER.

Enrolled July 11, 1850.

Specification of the Patent granted to ENOCH CHAMBERS, *of* 27, *Pope-street, Birmingham, in the County of Warwick, Smith, for Improvements in the Manufacture of Wheels.*—Sealed *November* 10, 1849.

WITH AN ENGRAVING.

To all to whom these presents shall come, &c., &c.—My invention consists of improvements in the manufacture

of wrought-iron wheels; and in order that the same may be fully understood and readily carried into effect, I will proceed to describe the means pursued by me.

Description of the Drawings.

Fig. 1, shows a wrought-iron wheel manufactured according to my invention.

Fig. 2, shows a transverse section thereof.

Figs. 3 and 4, show the wheel without the tyre.

Fig. 5, shows a side view and a transverse section of one-half the wheel; and

Fig. 6, shows three views of railway tyre of ordinary construction for the wheel.

Wheels made according to my invention are each first made up into two halves, each half consisting of one-half of the ring or felloe, one-half the spokes, and one-half of the nave, all of wrought-iron. And the parts of a wheel are made in the following manner:—For each half of the nave a block or plate of iron is forged into a cylindrical exterior form, with a flanch or projection all round; and this flanch or projection is to be drawn out by forging, so as to assume projecting arms at those parts in the circumference where the spokes are to be welded on; in the wheel shown there are eight spokes, four on each half-wheel; and in all cases this construction of wheel requires to have an even number of spokes, half being affixed or welded to one-half of the nave, and the other half of the spokes being fixed to the other half of the nave. The projection or flanch being thus drawn out or forged at intervals on each half the nave of an intended wheel, so as to produce proper projections for the purpose of receiving the spokes, the spokes are to be welded on, each spoke having a portion of the ring or felloe of the wheel forged thereon as shown, the alternate portions of the felloe or ring being on the two half-naves respectively, so that when the two are brought together, and the surfaces of the two half-naves are brought together, they will form a wheel, such as is indicated at figs. 3 and 4; the two half-naves of the wheel are then to be heated to a welding heat, and being placed in the position above described are to be welded together by a suitable hammer or press. I prefer to use a steam-hammer for this purpose, or two halves of naves may be welded together and the spokes attached afterwards. And the parts of

the felloe or ring of the wheel when they come together are also to be welded, and the tyre is to be shrunk on and the wheel completed; the centre of the nave of the wheel is to be cut or turned out, and made suitable to receive the axletree as shown, and as is well understood.

Having thus described the nature of my invention, and the manner of performing the same, I would remark that I do not confine myself to the form of the spokes or felloe, as the same may be varied, so long as the peculiar character of my mode of manufacturing wheels be retained.

But what I claim is,

First, the manufacture of wheels by first making the nave in two parts, divided vertically, each having half the number of spokes, with a portion of the felloe attached to each spoke, and then welding together the said two half-naves, after which the tyre is shrunk on as usual.

Secondly, I claim the making of wrought-iron naves with two projecting flanches, each to receive and have welded thereto one-half of the spokes, of which a wheel is to be composed.—In witness, &c.

ENOCH CHAMBERS.

Enrolled May 10, 1850.

Specification of the Patent granted to WILLIAM BUCKWELL, *of the Artificial Granite Works, Battersea, in the County of Surrey, Civil Engineer, for Improvements in Manufacturing Pipes and other Structures Artificially in Moulds, when using Stone and other Matters.*— Sealed November 17, 1849.

To all to whom these presents shall come, &c., &c.— My invention of manufacturing pipes and other structures where stone and other matter is used, consists of condensing, solidifying, and compressing such matters by subjecting them to percussion in moulds; and my invention also consists of improvements in forming the connexion of such pipes, and which is applicable to other pipes.

In describing my invention I will take, for example, a cylindrical structure or pipe; the material to be used,

such as stone or clean gravel, is to be broken and mixed with a small quantity of cement and a small quantity of liquid. I cause such matters to be fed or fall in this state into a strong cast-iron mould, of the form and dimensions of the intended cylinder pipe, the mould being firmly fixed and well supported. In this mould a ram works; I use and prefer for this purpose a steam-hammer, but other means of applying the requisite percussion may be used. In making pipes of four feet diameter, having a sectional thickness equal to four hundred square inches, I use a two and one-half ton hammer, capable of acting through a space of five feet, and working at the rate of fifty blows per minute. In making pipes of a less sectional thickness it is only necessary to diminish the space of the hammer acting, though the repetition of blows may be equally quick; and I prefer and recommend as advantageous a quick repetition of impact. As the mould is fed with the mixture, the ram or hammer strikes and beats it in the mould, and thus compresses or solidifies it; and the best effect I find to be produced by feeding in small quantities at a time between successive repetitions of blows or of the ram. When the mould is filled, so that the fall of the hammer or ram is diminished about two-thirds or three-fourths, more or less, the pipe so formed must be removed, provided it is of the desired length, or otherwise it must be moved so as to allow its length to be added to, without its being taken out of the mould, as in practice I have found it expedient not to take the structure out immediately, but to suffer the structure or pipe, or portion of pipe so made, to remain for a short time in the mould. For this purpose I adopt the following method, which I prefer and recommend as advantageous:—I make the mould and also the portion of the foundations to which it is to be fixed, of about double the depth of the space through which the hammer or ram is capable of acting. Supposing a pipe to have been formed four feet long, or a four feet portion of a pipe intended to be twelve feet long, the next blow, as hereafter explained, will carry the pipe or portion of a pipe forward into the lower part of the mould. In the case of its being a four feet pipe, a ring of iron fitting the mould, being of the like thickness as the substance of the pipe, being introduced to form the ends, and separate this pipe from the next, which will be made in the upper part of

the mould as before described. If the pipe is required of a greater length the separating ring is omitted, and the pipe continued in length by the addition which will be made in the upper part of the mould, in like manner as the first portion has been done. The pipe or portion of pipe in the lower part of the mould is then to be driven out, the upper pipe or portion following into its place, and which is effected thus:—The ring under the lower end of the pipe, and which formed a bottom in the mould at the commencement, resting on a strong plate or platform forming a support, which is held up by pistons working in cylinders filled with steam, the support moving with the pistons. This support, whilst a pipe or portion of a pipe is being formed, is fixed or locked up from descending, but when a pipe or portion of a pipe has been formed it is unfixed, and only held up by the force of steam or other power against the pistons. By the succeeding blow of the hammer, the pipe or portion of pipe in the lower part of the mould will be driven down, the support descending, and the pipe or portion of pipe in the upper part of the mould following.

By allowing the support to descend the pipe is then released, except that before it can be removed the support of the core part of the mould, (to which the inside of the pipe has been formed,) which has been supported by a prop moving in a cylinder, as a piston, fixed or locked up, must be unfixed. The prop will then descend, and the pipe can then be removed, the core mould remaining supported by the pipe or portion of pipe in the lower part of the mould. The pipe being removed, the steam or water-pressure being let into the cylinder will bring the prop back into its place of supporting the core part of the mould, where it is again to be bolted or fixed, or otherwise prevented from descending and the process repeated.

In the first instance, and before any pipe or other structure is formed in the mould, it will of course be necessary to place in the lower part of the mould as many separating rings, or other suitable filling capable of bearing the blows, as will bring the commencement of making a pipe or other structure within the acting space of the hammer or ram, which filling being driven out after the first pipe or other structure or portion has been formed, may then be removed, leaving the ring or

other form forming the bottom only under the pipe or other structure. It is also desirable to use the like filling at cessation of work, leaving it, the filling, in the mould, in preference to a pipe or other structure, or a portion thereof. In making any structure not requiring a core, as a landing, paving, solid block, column or pillar, the like process, as described in making pipes, is applicable, omitting the use of a core and its prop.

The materials of stone, when it is desirable to have great strength of resisting strains, I prefer and recommend to consist of hard, slightly absorbent carbonate of limestone, such as some of the hard oolite, in a broken, crushed, or fractured state, with other matter, and when it is desirable to have a very hard, dense mass to resist crush, I prefer and recommend the use with other matter of flint, gravel, or shingle, or other like stone, mixed or unmixed, with the oolite or other similar stone; I use and prefer it to be in fragments, of which the greater part shall be two-thirds the mesh or guage of the substance of the structure to be formed, the remainder being assimilated to fill interstices; and in mixing cement I apply it in quantity according to the amount of surface in the fragment or broken stone. In large structures I have used it, one part cement to four and sometimes more of stone. The cements I use and recommend are those containing a large quantity of clay, and that have been burnt a long time, of which the Portland is highly applicable; but I prefer cement, having a larger quantity of clay, and subjected to a larger amount of firing. But other cements may be used, as well as any of the limes suitable to withstand the action to which the structure is to be applied.

As respects the quantity of liquid to be applied to any of the mixtures before subjecting them to the percussion in moulds, I would state, it is impossible to specify any exact proportion, as the quantity of surface would materially affect it, and the stone or other matter itself varies as to its driness, according to circumstances, and particularly according to the condition of the atmosphere in general; it will be necessary to mix a small quantity of water or matter in a fluid state; I have found in some cases about five per cent. in weight sufficient. If it be not sufficiently damp when subjected to percussion, the stone will powder and dust will arise, and the solidification

will not be complete; if, on the other hand, it be too much loaded with liquid, the excess will show itself on the surface, and in this case again the effect of percussion will be less perfect. A workman will very soon be able to judge with sufficient accuracy of the proper condition from the mere appearance of the materials. It will have been obvious that the percussion applied is on matter in moulds, the sides of which are parallel to the direction of the percussion; consequently, the pipes or other structures are without projections; and my improvements in connecting pipes are with reference to all pipes without projections, by means of an expanding and collapsing band, the bands being cast with internal flanges; and a bolt-hole, the line of which forms a tangent, being cast and collapsed by the same bolt, so that they may be rather less than the external diameter of the pipe, is to be turned out to nearly fit the pipes where necessary, and being allowed to expand and placed on the pipes, the screw will draw the flange of the band tight to the external surface of the pipes. When applying the bands to cast-iron or other metallic pipes, I prefer and recommend a chase to be turned or cast in at the ends of the pipes, a little broader than the thickness of the flanges of the band. If accurately fitted, the joints can be made steam tight without any cement, a small piece of gutta percha or vulcanized caoutchouc, or other matter being introduced at the jointing in the band; but in using cement or bedding of any kind a very small quantity is required, and the joints are made with great facility.

Having thus described the nature of my invention, and the manner of performing the same, I would have it understood that what I claim is, the compressing or solidifying by percussion, as herein described, in moulds, cylindrical structures called pipes, and other structures where stone and other matter is used; and I also claim the connecting or joining of such cylindrical structures or pipes, and other pipes made without projections or flanges, by means of a collapsing and expanding metal band, as herein described.—In witness, &c.

WILLIAM BUCKWELL.

Enrolled May 16, 1850.

Specification of the Patent granted to WILLIAM THOMAS BERGER, *of Hackney, Gentleman, for Improvements in the Manufacture of Starch.*—Sealed January 26, 1850.

To all to whom these presents shall come, &c., &c.—I would at the outset state, that although I shall hereafter describe the use of caustic alkali upon rice, I do not claim the same; inasmuch as Mr. Wickham, of Nottingham, took out a patent for this object in the year 1824.

In carrying out my invention, I find it advantageous to steep the rice in the first instance, in succession, in three or four separate solutions of the caustic alkali (soda preferred) of the following strength, viz., from 190 to 220 grains of pure soda to every gallon of water.

I then proceed as follows:—A ton of rice having been thoroughly steeped in three or four separate solutions (of about 300 gallons each) of the caustic alkali, and drawn off, it is now to be ground as fine as possible, by means of levigators with cold water, to the consistence of thick cream or paste; to this is to be added one pint of spirit or oil of turpentine, with sufficient cold water to make up the bulk to about [illegible]000 gallons; the whole is to be well stirred for three hours, after which it is to be passed through a series of coarse flannels, felt, or sponge, until all the refuse is deposited upon the flannel or filtering medium. Or it may be left quiet for about half an hour, when the starch, suspended in the water, may be drawn off from the refuse matters.

These starchy waters are always to be passed through fine lawn sieves prior to their being allowed to deposit the starch in the settling vessels. The application of water may be repeated, if it is thought desirable to separate further quantities of starch from the refuse.

As soon as the starch is perfectly deposited in the settling vessels, it is to be collected, and if alkaline, neutralized with dilute sulphuric acid; adding eight ounces of sulphate of zinc to every 112 pounds of starch: it is now, after well stirring, to be boxed and finished in the usual way.

The above is the process I prefer, and have found most efficacious, simple, and least expensive; but the metallic salts in general, also sulphate of soda, (especially if combined with lime water,) turpentine, alum, and a current of electricity, will severally be found effectual in place of the turpentine and sulphate of zinc. I do not, therefore, confine myself to the process described, nor to the quantity of either of the agents employed, nor to any particular combination of them.

When currents of electricity (however produced) are employed, the application should be continued for about two hours on each occasion; and the same is to be passed through the fluid starch, as electric currents are commonly passed through fluids; and I stir the fluid starch all the time of applying such currents.

I use a Smee's battery of six cells, about five inches by seven inches, when acting to produce five hundred weight of starch. And I have found it desirable to apply the electricity first to the rice when ground with water, and lastly to the starch previous to its being boxed.

Another part of my invention consists of the application of a barrel or vessel containing the rice and alkali solution, and caused to revolve by any convenient means, at the speed of about one revolution per minute, which I have found to be very efficacious in extracting the gluten out of the rice; the si[illegible] the barrel I prefer is five feet in diameter, and about [illegible] feet in length, which will contain a ton of rice, and the 300 gallons of alkali solution. I have found allowing each solution to remain upon the rice three hours, while the barrel is at work, to be amply sufficient.

I do not confine myself to the use of a barrel, as a vessel of other form will answer the purpose; or in place of causing the vessel to revolve, a stirrer, caused to revolve whilst the vessel stands still, will produce a like effect, but I prefer the vessel to revolve.

What I claim is,

First, the manufacturing starch from rice by using turpentine and sulphate of zinc as described; and also the straining the starchy waters, and boxing the starch, in those stages.

Second, the use of metallic salts, also sulphate of soda, turpentine, alum, and electricity, whether separately, or in combination, in the manufacture of starch.

Third, the use of flannel, felt, and sponge, as a medium for separating the refuse matters from starch.

Fourth, the application of mechanical stirring, or the rotation of the vessel containing rice when being steeped in a solution of caustic alkali, or other solution, used when making starch from rice.—In witness, &c.

WILLIAM THOMAS BERGER.

Enrolled July 26, 1850.

LAW REPORTS OF PATENT CASES.

EDWARDS AND OTHERS *v.* DA COSTA AND OTHERS.

In the Court of Exchequer, at Guildhall, before the Lord Chief Baron (Pollock), and a Special Jury.

(*Continued from* page 122.)

Now the question I shall leave to you is this:—Do you believe that the process of the plaintiffs as it now exists is a new one or not? has it been known before in that form? is the doing it, is the treating the potatoes in the way the plaintiffs' process points out, the cause of its success? There have been many cases perfectly familiar in courts of justice, where the least thing in the world has made the whole difference between failure and success, and it is to protect success that a patent is granted. There may be as much novelty in leaving a thing out as there is in substituting or putting in something entirely new. Well, then, the question for you on this part of the case is, whether you think that any one of these publications published the processes. The only other point is, whether the plaintiffs under these circumstances can justly charge the defendants with imitating or using their process. Now the spirit of this patent certainly appears to me to be the combination of Grenet's plan for the cooking and granulation of the potatoes (so as to bring them into a certain form) with Forsyth's application of heat. It may be that it did not occur to Grenet, or any one else, to use a higher temperature than was suggested,

of a room warmed by a stove. It may be that Forsyth thought the slicing the potatoes or bringing them into the state of pulp would answer the same purpose. But there is an essential difference between Forsyth's process and others. Forsyth's process cooks the potatoes in the process of drying; the other cooks them before they begin to dry; the patentees combine the two together, and it is successful. Do the defendants infringe that process? The patentee says, having stated so and so, I would have you to understand I make no claim to any of the apparatus herein described, nor do I confine myself thereto, though I consider the means above described the most simple and best for performing the invention. "But what I claim as my invention is the mode of preserving potatoes, in a cooked or partially cooked state, by means of obtaining the substance of potatoes in a separated or finely divided and dried state as described." Then, Gentlemen, you are to judge of the evidence to-day, whether, instead of exposing these pieces of cooked potatoes on a warm, heated apparatus, at a high temperature, ranging from 160 to 120 degrees of Fahrenheit—whether, when it was discovered, that would answer—whether you think that the submitting the same article to the hot blast is only another mode of applying heat, which Mr. Phillips says is the same in effect, but different in its mode. Gentlemen, if you think that the mode which is adopted by the defendants is merely another mode of supplying or applying heat, perfectly familiar to engineers, mechanics, and persons whose minds are devoted to those pursuits; if you think that it is merely another application, but adopting the spirit of the plaintiffs' process; if you think it is the spirit of the invention, and that it is merely a varying of the mode by what is termed a colorable process, but a process resulting in the same effects, and Mr. Phillips says that they are the same in effect, but different in mode.—If it is merely a difference in the mode of producing the same effects, it is for you to say how far it is the same thing, producing the same thing by a different mode, colorably adapted. If you think so, then I think the plaintiffs would be entitled to your verdict; the amount of damages would be merely nominal.

Mr. Cockburn.—My Lord, I propose humbly to except to your Lordship's direction; first, upon the ground that

your Lordship states to the Jury that, in point of law, there was nothing in the publications put in, no evidence to prevent the plaintiffs' patent.

The Lord Chief Baron.—No; I have not stated that. I say, if it be a question of law, then, in my opinion, it should be decided for the plaintiffs.

Mr. Cockburn.—Then I except to your stating that to the Jury.

The Lord Chief Baron.—No; I leave it also as a matter of fact to the Jury.

Mr. Cockburn.—These exceptions I make, then, to your Lordship's ruling; and your Lordship will deal with them as you think proper. I submit that your Lordship should do one of two things, either that you should leave it as a question of law, and that the matter should be so disposed of and be so treated, or that the Jury should have it left to them as a matter of fact. I say that your Lordship ought to treat it either as a question of law or as a matter of fact, and leave it to the Jury in that way. If your Lordship treat the question as a matter of fact, then I should submit that your Lordship should not state anything about the law.

The Lord Chief Baron.—Very well; I understand the distinction you draw. Gentlemen of the Jury, there is no doubt that the Learned Counsel may turn out to be perfectly correct. It may be wrong to take what was an alternative view of the question. I am inclined to think it is a question of fact for you, and if it be so, you will dispose of it. If it is a question of law for me, then I am of opinion that these publications are not evidence against this patent. The Learned Counsel says, I should treat it as a question of law or of fact. I think it better and safer to the administration of the law, and for the purpose of consulting the ends of justice, to leave the question to you both ways; the question of law I shall dispose of, and as a question of law I then say that these publications fail to defeat the plaintiffs' patent, and as to the question of fact you will decide.

Mr. Cockburn.—Then, my Lord, there is another question. Your Lordship has directed the Jury, that if the combination is new, then that the patent of the plaintiffs is good, notwithstanding some parts of the process were old.

The Lord Chief Baron.—My opinion, Gentlemen, is

M 2

that a particular part of a process being old is no objection to the combination.

Mr. Cockburn.—I submit that your Lordship in putting it to the Jury, if the combination were new, it was immaterial to this question whether a part of that combination were old, that point also I make a ground of my exceptions, and that the process or invention is not of that character as will support a patent.

The Lord Chief Baron.—In my opinion, the question of more or less is a very difficult one. I have thought a good deal about this matter, and I think it exceedingly difficult to say what is so trifling as to be of no importance, and what is important enough to be the subject of a patent. The only safe rule is to look at what has been the practical effect. A new sort of manufacture has risen up within the last seven years, which, according to Sir W. Burnett's evidence, has never existed before. Therefore, Gentlemen, I have nothing to offer in respect to that. Then, if you think the invention is in itself new, by reason of any combination, notwithstanding the parts of the process were known, then I think the plaintiffs are entitled to the benefit of their patent.

Mr. Cockburn.—I trust your Lordship will not deem that I am at all disrespectful in—

The Lord Chief Baron.—Not at all; I think there is nothing more mischievous than the old notion, that tendering a bill of exceptions was disrespectful to the Judge.

Mr. Cockburn.—I merely wanted to make a single observation. I am instructed to except to your Lordship's ruling. I submit that the Judge should not be the Jury.

Mr. M. Smith.—The object of the tendering a bill of exceptions is very obvious, it is to correct an error if there be one.

Mr. Cockburn.—Therefore, I shall tender my exceptions, as I have stated.

The Lord Chief Baron.—I think I am bound to ask what the exceptions are, and to listen to any remarks made by either side to correct these exceptions.

Mr. M. Smith.—The very object is to see that the exceptions are correct, in order that they may be put in before the Jury give their verdict.

The Lord Chief Baron.—No doubt it is.

[The Jury then retired.]

The Lord Chief Baron.—Mr. Cockburn, I will read my note of your exceptions, it is that I should have left the fact as fact, and the law as law.

Mr. Cockburn.—Your Lordship first began by stating what was the law.

The Lord Chief Baron.—I say if it is law I state my opinion, and I say if it is a question of law there is nothing in the publications.

Mr. Cockburn.—You did say so, but your Lordship stated an hypothesis of your own.

The Lord Chief Baron.—I put it in the alternative, "it is either a question of fact or law, if fact I leave it to you, if law I decide so and so," and as to the law I may be wrong. I understand you to object to my leaving it in that manner.

Mr. Cockburn.—If it is a question of law, the law is so and so; then I except in the first place to your Lordship's stating the law in the way you did. If it was a question of law, the law was so and so.

The Lord Chief Baron.—If it was a question of law.

Mr. Cockburn.—I say it is either a question of law or fact, and should so have been put to the Jury.

The Lord Chief Baron.—Then you had better put it, that it was not competent in the Judge to put it alternately as a question of law or fact.

Mr. Cockburn.—What I understood to be the way your Lordship put it is this, "You say it is a question of law, and my opinion on the law is so and so, and I shall also leave it to you as a question of fact." You did not point out the distinction.

The Lord Chief Baron.—Yes, I did.

Mr. Cockburn.—That would be another ground. I understood your Lordship to begin by stating it to be matter of law, and then you left it as a question of fact to the Jury, and that is what I except to.

The Lord Chief Baron.—These are your exceptions, then, first, that the law as laid down by the Judge, if it be a matter of law, was wrong.

Mr. Cockburn.—Yes.

The Lord Chief Baron.—Secondly, that it was not competent to the Judge to leave it alternately as a question of fact to the Jury, that should have said, "either it is a fact for you or law for me," that I should not have put it in the alternative state.

Mr. Cockburn.—I will add this also, that if it was a question of mixed fact and law, then you ought not to direct the Jury.

The Lord Chief Baron.—Yes.

Mr. Cockburn.—I understood you not to direct the Jury in that supposed state of circumstances.

The Lord Chief Baron.—Yes, I did.

Mr. Cockburn.—If that is the case, if your Lordship directs the Jury, mixing the law and the fact together, I am entitled to except to your directions.

The Lord Chief Baron.—That is so far as I lay down the law, I did not lay it down absolutely, that I am sure, but conditionally.

Mr. Cockburn.—Your Lordship directed the Jury, if the combination in the plaintiffs' invention was new.

The Lord Chief Baron.—Although the parts were old, I said there might be a combination of old things which would support a patent.

Mr. Cockburn.—I understood your Lordship to say the plaintiffs' specification to which they applied.

Mr. M. Smith.—That you left to the Jury.

The Lord Chief Baron.—That I left to the Jury; all that I lay down generally is, that in my judgment a combination of old things put together, if the application is new, will support a patent.

Mr. Cockburn.—It is admitted in this case that the parts are old.

The Lord Chief Baron.—Yes, that is quite clear. I have no doubt the plaintiffs' invention takes part from Grenet, and the other parts from Forsyth, and he puts them together, and I leave it to the Jury, whether the combination is new and useful.

Mr. Cockburn.—Notwithstanding that, your Lordship sees the plaintiffs' specification may be such—

The Lord Chief Baron.—If the plaintiffs' specification is not sufficient, I will reserve that for you, if you can put it in any way.

Mr. Cockburn.—I certainly understand your Lordship to say, if the "combination" was new that would uphold the plaintiffs' patent.

The Lord Chief Baron.—I think that is so.

Mr. Cockburn.—I except to your Lordship stating that I say reference being had to the circumstances, that is not so.

The Lord Chief Baron.—And I leave that as a question to the Jury. I lay it down to them as the general principle of law.

Mr Cockburn.—The particular thing is nothing, unless it is applied to the process. I thought I understood your Lordship to say to the Jury, that if the "combination" of the plaintiffs' invention was new, notwithstanding parts were old, that was sufficient.

The Lord Chief Baron.—Then that will justify the patent, if they thought it was new and useful.

Mr. Cockburn.—That is quite enough, that is what I except to.

The Jury then returned into court, and gave a verdict for the plaintiffs. Damages, *5l.* Costs, *40s.*

Mr. Martin.—Your Lordship will certify that the validity of the patent came into question, and for a special jury.

The Lord Chief Baron.—Certainly.*

AN ACT TO EXTEND AND AMEND THE ACTS RELATING TO THE COPYRIGHT OF DESIGNS.

[*August* 14, 1850.]

ANNO DECIMO TERTIO ET DECIMO QUARTO VICTORIÆ REGINÆ.—CAP. CIV.

WHEREAS it is expedient to extend and amend the Acts relating to the Copyright of Designs: be it therefore enacted by the Queen's most Excellent Majesty, by and with the advice and consent of the Lords Spiritual and Temporal, and Commons, in this present Parliament assembled, and by the authority of the same:—

I. That the Registrar of Designs, upon application by or on behalf of the proprietor of any design not previously published within the United Kingdom of Great Britain and Ireland or elsewhere, and which may be registered under the Designs Act, 1842, or under the Designs Act, 1843, for the provisional registration of such design under this Act, and upon being furnished with such copy, drawing, print, or description in writing

* In this case there was a writ of *scire facias* pending to repeal the patent, but the bill of exceptions and also the writ of *scire facias* have been abandoned.—ED.

or in print as in the judgment of the said Registrar shall be sufficient to identify the particular design in respect of which such registration is desired, and the name of the person claiming to be proprietor, together with his place of abode or business, or other place of address, or the style or title of the firm under which he may be trading, shall register such design in such manner and form as shall from time to time be prescribed or approved by the Board of Trade; and any design so registered shall be deemed "provisionally registered," and the registration thereof shall continue in force for the term of one year from the time of the same being registered as aforesaid; and the said Registrar shall certify, under his hand and seal of office, in such form as the said Board shall direct or approve, that the design has been provisionally registered, the date of such registration, and the name of the registered proprietor, together with his place of abode or business, or other place of address.

II. That the proprietor of any design which shall have been provisionally registered shall, during the continuance of such registration, have the sole right and property in such design, and the penalties and provisions of the said Designs Act, 1842, for preventing the piracy of designs, shall extend to the acts, matters, and things next hereinafter enumerated, as fully as if those penalties and provisions had been re-enacted in this Act, and expressly extended to such acts, matters, and things respectively; that is to say,

1. To the application of any provisionally registered design, or any fraudulent imitation thereof, to any article of manufacture or to any substance.
2. To the publication, sale, or exposure for sale of any article of manufacture or any substance to which any provisionally registered design shall have been applied.

III. That during the continuance of such provisional registration neither such registration nor the exhibition or exposure of any design provisionally registered, or of any article to which any such design may have been or be intended to be applied, in any place, whether public or private, in which articles are not sold or exposed or exhibited for sale, and to which the public are not admitted gratuitously, or in any place which shall have been previ-

ously certified by the Board of Trade to be a place of public exhibition within the meaning of this Act, nor the publication of any account or description of any provisionally registered design exhibited or exposed or intended to be exhibited or exposed in any such place of exhibition or exposure in any catalogue, paper, newspaper, periodical, or otherwise, shall prevent the proprietor thereof from registering any such design under the said Designs Acts at any time during the continuance of the provisional registration, in the same manner and as fully and effectually as if no such registration, exhibition, exposure, or publication had been made; provided that every article to which any such design shall be applied, and which shall be exhibited or exposed by or with the licence or consent of the proprietor of such design, shall have thereon or attached thereto the words "provisionally registered," with the date of registration.

IV. That if during the continuance of such provisional registration the proprietor of any design provisionally registered shall sell, expose, or offer for sale any article, substance, or thing to which any such design has been applied, such provisional registration shall be deemed to have been null and void immediately before any such sale, offer, or exposure shall have been first made; but nothing herein contained shall be construed to hinder or prevent such proprietor from selling or transferring the right and property in any such design.

V. That the Board of Trade may, by order in writing, with respect to any particular class of designs, or any particular design, extend the period for which any design may be provisionally registered under this Act, for such term, not exceeding the additional term of six months, as to the said Board may seem fit; and whenever any such order shall be made, the same shall be registered in the Office for the Registration of Designs, and during the extended term, the protection and benefits conferred by this Act in case of provisional registration shall continue as fully as if the original term of one year had not expired.

VI. That the Registrar of Designs, upon application by or on behalf of the proprietor of any sculpture, model, copy, or cast, within the protection of the sculpture copyright Acts, and upon being furnished with such copy

drawing, print, or description, in writing or in print, as in the judgment of the said Registrar shall be sufficient to identify the particular sculpture, model, copy, or cast, in respect of which registration is desired, and the name of the person claiming to be proprietor, together with his place of abode or business, or other place of address, or the name, style, or title of the firm under which he may be trading, shall register such sculpture, model, copy, or cast, in such manner and form as shall from time to time be prescribed or approved by the Board of Trade, for the whole or any part of the term during which copyright in such sculpture, model, copy, or cast may or shall exist under the Sculpture Copyright Acts; and whenever any such registration shall be made, the said registrar shall certify, under his hand and seal of office, in such form as the said Board shall direct or approve, the fact of such registration, and the date of the same, and the name of the registered proprietor, or the style or title of the firm under which such proprietor may be trading, together with his place of abode or business, or other place of address.

VII. That if any person shall, during the continuance of the copyright in any sculpture, model, copy, or cast, which shall have been so registered as aforesaid, make, import, or cause to be made, imported, exposed for sale, or otherwise disposed of any pirated copy or pirated cast of any such sculpture, model, copy, or cast, in such manner and under such circumstances as would entitle the proprietor to a special action on the case under the Sculpture Copyright Acts, the person so offending shall forfeit for every such offence a sum not less than five pounds and not exceeding thirty pounds to the proprietor of the sculpture, model, copy, or cast, whereof the copyright shall have been infringed; and for the recovery of any such penalty the proprietor of the sculpture, model, copy, or cast, which shall have been so pirated, shall have and be entitled to the same remedies as are provided for the recovery of penalties incurred under the Designs Act, 1842: provided always, that the proprietor of any sculpture, model, copy, or cast which shall be registered under this Act shall not be entitled to the benefit of this Act, unless every copy or cast of such sculpture, model, copy, or cast which shall be published by him after such registration shall be marked with the word "registered," and with the date of registration.

VIII. That designs for the ornamenting of ivory, bone, papier maché, and other solid substances not already comprised in the classes numbered 1, 2, or 3 in the Designs Act, 1842, shall be deemed and taken to be comprised within the class numbered 4 in that Act, and such designs shall be so registered accordingly.

IX. That the Board of Trade may from time to time order that the copyright of any class of designs, or any particular design, registered or which may be registered under the Designs Act, 1842, may be extended for such term, not exceeding the additional term of three years, as the said Board may think fit, and the said Board shall have power to revoke or alter any such order as may from time to time appear necessary; and whenever any order shall be made by the said Board under this provision, the same shall be registered in the office for the registration of designs; and during the extended term the protection and benefits conferred by the said Designs Acts shall continue as fully as if the original term had not expired.

X. That the Board of Trade may from time to time make, alter, and revoke rules and regulations with respect to the mode of registration, and the documents and other matters and particulars to be furnished by persons effecting registration and provisional registration under the said Acts and this Act: provided always, that all such rules and regulations shall be published in the "London Gazette," and shall forthwith upon the issuing thereof be laid before Parliament, if Parliament be sitting, and if Parliament be not sitting, then within fourteen days after the commencement of the then next session; and such rules and regulations, or any of them, shall be published or notified by the registrar of designs in such other manner as the Board of Trade shall think fit to direct.

XI. That if in any case in which the registration of a design is required to be made under either of the said Designs Acts, it shall appear to the Registrar that copies, drawings, or prints, as required by those Acts cannot be furnished, or that it is unreasonable or unnecessary to require the same, the said Registrar may dispense with such copies, drawings, or prints, and may allow in lieu thereof such specification or description in writing or in print as may be sufficient to identify and render intelli-

gible the design in respect of which registration is desired; and whenever registration shall be so made in the absence of such copies, drawings, or prints, the registration shall be as valid and effectual to all intents and purposes as if such copies, drawings, or prints had been furnished.

XII. That in order to prevent the frequent and unnecessary removal of the public books and documents in the Office for the Registration of Designs, no book or document in the said office shall be removed for the purpose of being produced in any Court, or before any Justice of the Peace, without a special order of a Judge of the Court of Chancery, or of one of Her Majesty's Superior Courts of Law, first had and obtained by the party who shall desire the production of the same.

XIII. That if application shall be made to a Judge of any of Her Majesty's Courts of Law at Westminster by any person desiring to obtain a copy of any registration, entry, drawing, print, or document, of which such person is not entitled as of right to have a copy, for the purpose of being used in evidence in any cause, or otherwise howsoever, and if such Judge shall be satisfied that such copy is *bonâ fide* intended for such purpose as aforesaid, such Judge shall order the Registrar of Designs to deliver such copy to the party applying, and the Registrar of Designs shall, upon payment for the same of such fee or fees as may be fixed according to the provisions of the said Designs Act in this behalf, deliver such copy accordingly.

XIV. That every copy of any registration, entry, drawing, print, or document delivered by the Registrar of Designs to any person requiring the same shall be signed by the said Registrar, and sealed with his seal of office; and every document sealed with the said seal, purporting to be a copy of any registration, entry, drawing, print, or document, shall be deemed to be a true copy of such registration, entry, drawing, print, or document, and shall, without further proof, be received in evidence before all Courts in like manner, and to the same extent and effect as the original book, registration, entry, drawing, print, or document would or might be received if tendered in evidence, as well for the purpose of proving the contents, purport, and effect of such book, registration, entry, drawing, print, or document, as also proving

the same to be a book, registration, entry, drawing, print, or document of or belonging to the said office, and in the custody of the Registrar of Designs.

XV. That the several provisions contained in the said Designs Acts (so far as they are not repugnant to the provisions of this Act) relating to the transfer of designs, to cancelling and amending registration, to the refusal of registration in certain cases, to the mode of recovering penalties, to the awarding and recovery of costs, to actions for damages, to the limitation of actions, to the certificate of registration, to penalties for wrongfully using marks, to the fixing and application of fees for registration, and to the penalty for extortion, shall apply to the registration, provisional registration, and transfer of designs, sculptures, models, copies, and casts, and to the designs, sculptures, models, copies, and casts entitled to protection under this Act, and to matters under this Act, as fully and effectually as if those provisions had been re-enacted in this Act with respect to designs, sculptures, models, copies, and casts registered and provisionally registered under this Act; and the forms contained in the Designs Act, 1842, may for the purposes of this Act be varied so as to meet the circumstances of the case.

XVI. That in the interpretation of this Act the following terms and expressions shall have the meanings hereinafter assigned to them, unless such meanings shall be repugnant to or inconsistent with the context or subject matter; that is to say,

The expression "Designs Act, 1842," shall mean an Act passed in the sixth year of the reign of Her present Majesty, intituled *An Act to consolidate and amend the Laws relating to the Copyright of Designs for ornamenting Articles of Manufacture:*

The expression "Designs Act, 1843," shall mean an Act passed in the seventh year of Her present Majesty, intituled *An Act to amend the Laws relating to the Copyright of Designs:*

The expression "Sculpture Copyright Acts," shall mean two Acts passed respectively in thirty-eighth and fifty-fourth years of the reign of King George the Third, and intituled respectively, *An Act for encouraging the Art of making new Models and Casts of Busts and other things herein mentioned;*

and *An Act to amend and render more effectual an Act for encouraging the Art of making new Models and Casts of Busts and other things therein mentioned:*

The expression "The Board of Trade" shall mean the Lords of the Committee of Privy Council for the consideration of all matters of trade and plantations:

The expression "Registrar of Designs" shall mean the Registrar or Assistant Registrar of Designs for articles of manufacture:

The expression "Proprietor" shall be construed according to the interpretation of that word in the said Designs Act, 1842:

And words in the singular number shall include the plural, and words applicable to males shall include females.

XVII. That in citing this Act in other Acts of Parliament, and in any instrument, document, or proceeding, it shall be sufficient to use the words and figures following, that is to say, "The Designs Act, 1850."

SCIENTIFIC MISCELLANEA.

Researches on the Theory of the principal Phenomena of Photography in the Daguerreotype Process. By A. CLAUDET.*

ALTHOUGH the daguerreotype process has, during the last ten years, been investigated by a great number of philosophers, and brought to a considerable degree of perfection by a still greater number of practitioners, it may appear surprising that the principal phænomena upon which this new art is founded, are still enveloped in a mysterious darkness.

My constant endeavour has been to explain them, and at the two last Meetings of the British Association I have had the honour of communicating the results of some of my researches.

The phænomena which have not yet been satisfactorily explained, and of which I shall have to treat in the present paper, are those referring to the following points:—

* Communicated to the "Philosophical Magazine."

1. What is the action of light on the sensitive coating?
2. How does the mercurial vapour produce the daguerreotype image?
3. Which are the particular rays of light that impart to the chemical surface the affinity for mercury?
4. What is the cause of the difference in achromatic lenses between the visual and photogenic foci? why do they constantly vary?
5. What are the means of measuring the photogenic rays, and of finding the true focus at which they produce the image?

At the last Meeting of the British Association, which took place at Swansea, I announced that the decomposition of the chemical surface of the daguerreotype plate by the action of certain rays of light produced on that surface a white precipitate, insoluble in the hyposulphite of soda, which, when examined by the microscope, had the appearance of crystals reflecting light, and which, when seen by the naked eye, were the cause of a positive daguerreotype image.

This fact had not been observed before. The opinion of Daguerre himself and other writers was, that the action of light on the iodide of silver had only the effect of darkening the surface, and consequently of producing a negative image. But it escaped them, that, under the darkened iodide of silver, another action could take place after a continued exposure to light, and that the hyposulphite of soda washing could disclose a positive image. I have proved this unexpected fact in obtaining, by the action of light only, and without mercury, images having the same appearance as those developed under the action of mercurial vapour. This direct and immediate effect of light is certainly remarkable; but the daguerreotype process is not founded on that principle on account of the slowness of its action; and it is fortunate that, long before light can produce the white precipitate I have alluded to, it operates another effect, which is the wonderful property of attracting the vapour of mercury. This vapour is condensed in the form of a white powder, having also, when examined by the microscope, the appearance of reflecting crystals. The daguerreotype image is due to this property, which is the most beautiful feature of Daguerre's discovery.

M. Moser has given an ingenious theory of the action

of mercury. Knowing that the yellow ray had the property of continuing the effect commenced by light on the iodide of silver, he has supposed that mercury, when in a state of vapour, evolves a latent yellow light, and to the action of that yellow light of mercurial vapour he ascribes the continuation of the decomposition of the iodide of silver. But as the analysis of the surface discloses the presence of mercury, that metal must have been amalgamated with the silver set free after the action of light. We must, therefore, look for another explanation of the phænomenon.

It is more probable that light exercises a twofold action on the iodide of silver, whether it is combined or not with chlorine or bromine. By one, the iodide is decomposed, and the silver set free is precipitated on the surface in the form of a white powder or small crystals; by the other, which begins long before the former, the parts affected by light have been endowed with an affinity for mercurial vapour.

By means of my photographometer, to the principle of which I shall presently refer, I have been able to ascertain that the pure light of the sun performs in about two or three seconds the decomposition of the bromo-iodide of silver, which is manifested by the white precipitate; while the same intensity of light determines the affinity for mercurial vapour in the wonderfully short space of about one-thousandth part of a second. So that the affinity for mercury is imparted by an intensity of light 3,000 times less than that which produces the decomposition manifested by the white precipitate.

For this reason it is difficult to suppose that the two actions are the same. We must admit that they are different. Long before it can effect the decomposition of the surface, light imparts to the sensitive coating the affinity for mercurial vapour; and this appears to be the principle of the formation of the image in the daguerreotype process.

In a paper I communicated to the Royal Society on the 17th of June, 1847 (see Transactions), and an abstract of which I read before the Association at Oxford, I stated that the red, orange, and yellow rays were destroying the action of white light, and that the surface was recovering its former sensitiveness or unaffected state after having been submitted to the action of these rays. I inferred

from that curious fact, that light could not have decomposed the surface; for if it had, it would be difficult to understand how the red, orange, or yellow rays could combine again, one with another, elements so volatile as bromine and iodine, after they had been once separated from the silver.

But I had not yet been able to ascertain that, when light has decomposed the bromo-iodide of silver, the red, orange, or yellow rays cannot restore the surface to its former state. The action of light, which can be destroyed by the red, orange, or yellow rays, does not determine the decomposition, which would require an intensity 3,000 times greater. It is the kind of action produced by an intensity 3,000 times less, giving the affinity for mercury, which is completely destroyed by the red, orange, or yellow rays. It seems, therefore, that I was right in saying that there was no decomposition of the compound during the short action which is sufficient to give the affinity for mercury, and in ascribing the formation of the image only to that affinity. White light, or the chemical rays which accompany it, communicate to the surface the affinity for mercury, and the red, orange, or yellow rays withdraw it. I must notice here a singular anomaly; viz., that when the sensitive surface is prepared only with iodine without bromine, the red, orange, or yellow rays, instead of destroying the action of white light, continue the effect of decomposition as well as that of affinity for mercury. Still there is a double compound of iodine which is far more sensitive than the simple compound, and on which the red, orange, or yellow rays exercise their destructive action, as in the case of the bromo-iodide.

The phenomenon of the continuing action of the red, orange, or yellow rays on the simple compound of iodide of silver, was discovered by M. Ed. Becquerel; and soon after M. Gaudin found, that not only those rays continue the action by which mercury is deposited, but that they develope without mercury an image having the same appearance as that produced by mercurial vapour.

M. Gaudin, not having observed the fact of the white precipitate, which is the result of the decomposition by the action of light, could not explain the cause of the image brought out under the influence of the yellow ray.

I have observed that the iodide of silver without bro-

mine is about 100 times more sensitive than the bromo-iodide to the action of light, which produces the decomposition of the compound forming the white precipitate of silver, while it is 100 times less sensitive for the effect which gives the affinity for mercury. This seems another reason for supposing that the two actions are different. It may be that, in the case of the iodide of silver alone, the decomposition being more rapid, and the affinity for mercury slower than when bromine is added to the compound, the red, orange, and yellow rays having to act upon an incipient decomposition, have the power, by their own photogenic influence, of continuing the decomposition when it has begun. This may explain the development of the image under red, orange, or yellow glasses, according to M. Gaudin's discovery. But in the case of the bromo-iodide of silver, the red, orange, or yellow rays have to exert their action on the affinity for mercury, begun a long time before the decomposition of the compound; and they have the property of destroying that affinity.

So that it would appear that all the rays of light have the property of decomposing the iodide of silver in a longer or shorter time, as they have that of producing the affinity for mercury on the bromo-iodide of silver; with the difference, that in the former compound the separate actions of the several rays continue each other, and that on the second compound these separate actions destroy each other. We can understand that, in the first case, all the rays are capable of operating the same decomposition; and that in the second, the affinity for mercury when imparted by one ray is destroyed by another. This would explain the various phenomena of the formation of the two different deposits I have described, and also explain the anomaly of the continuation of the action of light by the red, orange, or yellow rays, according to M. Ed. Becquerel's discoveries on the iodide of silver; and of the destruction of that action by the same rays, according to my own observations on the bromo-iodide of silver.

The red, orange, and yellow rays, when acting on an unaffected surface, are considerably less capable than the most refrangible rays of imparting the affinity for mercurial vapour on both the iodide and bromo-iodide of silver; and they destroy that affinity when it has been produced

on the bromo-iodide of silver by the photogenic rays. It follows from this fact, that when the red, orange, or yellow rays are more abundant in the light than the most refrangible rays, the photogenic effect is retarded in proportion to the excess of these antagonistic rays. This happens when there exists in the atmosphere some vapours which absorb the most refrangible rays. In these circumstances the light appears rather yellow; but it is very difficult to judge by the eye of the exact colour of the light, and of the proportion of photogenic rays existing in the atmosphere at any given moment.

The vapours of the atmosphere which render the light yellow, act as any other medium intercepting the blue rays, and those which have the same degree of refrangibility. I prove, by a very simple experiment, the comparative photogenic action of rays which have passed through such media, and of those which have met with no similar obstacle; also that media which intercept the photogenic rays can let pass freely the illuminating rays.

If I cover an engraving one-half with light yellow glass, and place it before my camera-obscura in order to represent the whole on a Daguerreotype plate, I find that during the time which has been necessary to obtain the image of the half not covered, not the slightest effect has been produced on the half covered with the yellow glass.

Now if I cover one-half with deep blue glass and the other with the same light yellow glass, the engraving will be seen very distinctly through the yellow glass, and not at all through the blue. In representing the whole, as before, on the Daguerreotype plate, the half which was clearly seen by the eye has produced no effect; and the other, which could not be seen, is as fully represented, and in nearly as short a time, as when no blue glass had been interposed.

Thus we might construct a room lighted only through an inclosure of light yellow glass, in which light would be very dazzling to the eye, and in this room no photographic operation could be performed; or a room inclosed by deep blue glass, which would appear very dark, and in which the photographic operation would be nearly as rapid as it would be in open air.

Thus we may conceive certain states of the atmosphere under which there will be an abundance of illuminating

rays, and very few photogenic rays; and some others, under which the reverse will take place.

Considering how difficult it is to judge by the eye alone of the photogenic state of light, we can understand why the photographer is constantly deceived in the effect he tries to produce, having no means to ascertain beforehand, with any degree of certainty, the intensity of light. For these reasons I turned my attention to contrive an apparatus by which I could test at the same time the sensitiveness of the Daguerreotype plate and the intensity of light.

I succeeded in constructing an instrument which I have called a photographometer, the description of which appeared in the "Philosophical Magazine" for the month of November, 1848.

As I have since improved it considerably, and made with it a great number of experiments, I shall briefly refer to this instrument, and describe the useful alterations I have made.

In the instrument described in the "Philosophical Magazine" for November, 1848, the light struck the Daguerreotype surface during the passage on an inclined plane of a metallic plate having seven apertures in a horizontal line, following the geometrical progression, 1, 2, 4, 8, 16, 32, 64; so that the Daguerreotype plate being covered with another metallic plate having four series of seven holes, the effect of light through every one of the seven holes was represented in proportion to the opening of the moveable plate. Every one of the four series of holes indicated the same number of white spots, and the number of spots was the measure of the light at the moment. I had four series of holes, in order to try several preparations on the same plate, or to test the light on the same plate at four different times.

The improvement I have made consists in my being able to shut every one of the holes by means of sliding blades; so that I can continue, by repeated falls, the geometrical progression from 1 to 512 on one plate; and when a second plate is added to the double apparatus, from 1 to 8,192. This enables me to compare and follow the different effects of light in a considerable range of intensities. This is done in the following manner:—After having given one fall with all the slides open, I shut one and give another fall, then shut the second slide and

give two falls, and so on, always doubling the number of falls for every new slide shut.

It is by this means that I have been able to discover at what degree of intensity of light the effect called solarization is produced;—on well-prepared plates of bromo-iodide it does not begin under an intensity 512 times greater than that which determines the first effect of mercury;—and also at what degree the decomposition producing the white precipitate without mercury manifests itself, both on iodide and on bromo-iodide of silver. On the first, it is 100 times quicker than on the bromo-iodide; and on the last, it is produced by an intensity 3,000 times greater than that which developes the first affinity for mercury.

The slides enable me to try the effect of different insulated rays on plates affected by white light. This is done by shutting one-half of each hole in pushing the sliding blades just enough for that purpose. In that state I submit the surface acted on by a great number of intensities of light to the subsequent radiation through red, orange, or yellow glasses, or any other coloured transparent media, in order to examine the action of these radiations on one-half of the effects produced by each intensity of light. By these means I have found, that before light has decomposed the surface and produced the white precipitate, the red, orange, and yellow rays destroy the affinity for mercury, and continue it when the decomposition has begun.

In the course of my experiments I noticed a curious fact, which proved very puzzling to me, until I succeeded in assigning a cause to it. I shall mention it here, because it may lead to some further discoveries. I observed that sometimes the spaces under the round holes, which had not been affected by light during the operation of the photographometer in a sufficient degree to determine the deposit of mercury, were, as was to be expected, quite black; while the spaces surrounding them were in an unaccountable manner slightly affected by mercury. At first I could not explain the phenomenon, except by supposing that the whole plate had been previously by accident slightly affected by light, and that the exposure through the holes to another sort of light had destroyed the former effect. I was naturally led to that explanation, having before observed that one kind of light destroys the effect of another; as, for example, that the effect of the light from the north is destroyed by the

light from the south, when certain vapours existing in the latter portion of the atmosphere impart a yellow tint to the light of the sun. But after repeated experiments, taking great care to protect the plate from the least exposure to light, and recollecting some experiments of M. Moser, I found that the affinity for mercury had been imparted to the surface of the Daguerreotype plate by the contact of the metallic plate having the round holes, while the space under the hole had received no similar action. But it must be observed that this phenomenon does not take place every time; some days it is frequent, and in some others it does not manifest itself at all. Considering that the plate furnished with round holes is of copper, and that the Daguerreotype plate is of silver plated on copper, it is probable that the deposit of mercury is due to an electric or galvanic action determined by the contact of the two metals; and perhaps the circumstance that the action does not take place every time, will lead to the supposition that it is developed by some peculiar electric state of the ambient atmosphere; and by a degree of dampness in the air, which would increase the electric current. May we not hope that the conditions being known in which the action is produced, and by availing ourselves of that property, it will be possible to increase on the Daguerreotype plate the action of light? for it is not improbable that the affinity for mercury imparted to the plate is also due to some electrical influence of light. How could we otherwise explain that affinity for mercury given by some rays and withdrawn by some others, long before light has acted as a chemical agent?

Photography is certainly one of the most important discoveries of our age. In relation to physics and chemistry, it has already been the means of elucidating many points which had not been investigated, or which were imperfectly known before. We may certainly expect that its study will prove of considerable use to the progress of these sciences. But it is in reference to optics that it opens a large field for research and discovery. Had Newton been acquainted with the properties with which light is endowed in the phenomena of photography, there is no doubt he would have left a more complete theory of light, and of the various rays which compose it.

Since the discovery of photography, opticians have

turned their attention to the constructing of new combinations of lenses, in order to increase the illuminating power without augmenting the aberration of sphericity. It is due to justice to state here, that the optician who first produced the best lenses for photography is M. Voigtlander, of Vienna, and they still are the most perfect that a photographer can use, particularly for portraits. In this country an optician of great merit, Mr. A. Ross, has constructed lenses on similar principles; and at all events has succeeded in producing some which work as quick, and give an image as perfect in every respect. In Paris M. Lerebours is renowned for lenses with larger focus, which are better adapted for taking views than any I have tried.

From the beginning of photography it was well known that the effective rays being the most refrangible, had a shorter focus than those producing white light; and for this reason Daguerre himself recommended the use of achromatic lenses, in which all the rays were supposed to coincide nearly at the same focus. All cameræ-obscuræ were furnished with achromatic lenses, and constructed so that the plate could be placed exactly at the same distance as the ground-glass on which the image had appeared the best defined. But with these cameræ-obscuræ it was very difficult to obtain a photographic image so perfect as that seen on the ground-glass; and it was only now and then, and as if by accident, that good pictures could be produced.

I soon observed that anomaly, and imagined that it was due to some errors in the respective position of the two frames; one holding the ground glass, and the other containing the plate, which, by warping or some other causes, might have been shifted to different distances from the object-glass.

Not being able to assign another reason for the error, I constructed a camera-obscura in which the ground glass and the plate were exactly placed in the same frame. In doing so I hoped to avoid the least error or deviation. But to my surprise, the more I was correct in my adjustment, the less I could obtain a well-defined Daguerreotype picture. This proved to me that I had to seek for another cause of the difficulty; and before going any further, I decided to try if the usual focus did or did not really coincide with the photogenic focus. For the expe-

riment, I placed at a distance from the camera-obscura several screens on different planes: these screens being covered with black lines, I could see them very distinctly on the ground glass. I tried the focus on one of the screens. To my surprise and delight, I found that invariably the one which had come out well-defined on the ground glass was confused on the Daguerreotype plate, and *vice versá*. This was sufficient to prove to me the cause of the difficulty I had been labouring under, viz., that the visual focus had not coincided with the photogenic focus. But the most surprising feature of that discovery was, that the photogenic focus was longer than the visual focus. On first consideration it should have been shorter, as the rays operating in photography are the most refrangible. Although I could not at first understand the cause of this anomaly, it was sufficient for me to know that, in order to have a well-defined Daguerreotype picture, I had only to set the focus on the ground glass for an object nearer the camera at the distance indicated by the experiment with the various screens. Continuing my experiment, I found some lenses in which the photogenic focus was shorter, and some others in which the two coincided.

I communicated a paper on the subject to the Royal Society and to the Académie des Sciences in May, 1844, and from that time photographers have been able to find the true photogenic focus of their camera; and opticians, who at first denied the fact, have at last studied and considered the question, trying to construct lenses in which the two foci should agree.

M. Lerebours, of Paris, was the first who, on my suggestion, examined the subject; and he communicated a paper to the Académie des Sciences, in which he explained the cause of the difference. He stated that, by altering the proportion between the angles inscribed in the curves either of the crown or flint-glass, he could render at will the photogenic focus longer or shorter than the visual focus, and by the same means could bring them to the same point. There is no question that M. Lerebours was right as far as the result referred to the chromatic correction; but if, according to the density of the two glasses, certain curvatures are required to correct the spherical aberrations, these curvatures cannot be altered with impunity only for the purpose of changing the directions of

the most refrangible rays. For this reason I have always preferred lenses in which the spherical aberration is the most perfectly corrected, without caring whether the photogenic rays coincided or not with the visual rays, having the means of ascertaining how I could obtain on my Daguerreotype plate the best-defined image. In fact, from my own observation that the red, orange, and yellow rays are antagonistic to the photogenic rays, and that the last rays have a greater power when the former are proportionately less abundant, I am of opinion that when the photogenic rays are only condensed on the plate, and the others are dispersed on the space more or less distant from the photogenic point, the action is more rapid. Rapidity being the principal object in photography, I prefer lenses in which the two foci are separated, although the operation is a little more difficult, and requires considerable care.

The question of the photogenic focus is involved in another kind of mystery, which requires some attention. I have found that with the same lenses there exists a constant variation in the distance between the two foci. They are never in the same relation to each other: they are sometimes more or less separate; in some lights they are very distant, and in some others they are very near and even coincide. For this reason I constantly try their position before I operate. I have not been able to discover the cause of that singular phenomenon, but I can state positively that it exists. At first, I thought that variations in the density of the atmosphere might produce the alteration in the distance between the two foci; or that when the yellow rays were more or less abundant, the visual rays were refracted on different points on the axis of the foci, according to the mean refrangibility of the rays composing white light at the moment. But a new experiment has proved to me that these could not be the real causes of the variation. I generally employ two object-glasses; one of shorter focus for small pictures, and the other of longer focus for larger images. In both the photogenic focus is longer than the visual focus; but when they are much separated in one they are less so in the other: sometimes, when they coincide in one, they are very far apart in the other, and sometimes they both coincide. This I have tried every day during the last twelve months, and I have always found the same varia-

tions. The density of the atmosphere, or the colour of light, seems to have nothing to do with the phenomenon, otherwise the same cause would produce the same effect in both lenses. I must observe that my daily experiments on my two object-glasses are made at the same moment and at the same distance for each, otherwise any alteration in the focal distance would disperse, more or less, the photogenic rays, which is the case, as I have ascertained. The lengthening or shortening the focus, according to the distance of the object to be represented, has for effect to modify the achromatism of the lenses. An optician, according to M. Lerebour's calculation, can at will, in the combination of the two glasses composing an achromatic lens, adapt such curvatures or angles in both that the visual focus shall coincide with the photogenic focus; but he can obtain the result only for one length of focus. The moment the distance is altered, the two foci separate, because the visual and photogenic rays must be refracted at different angles in coming out of the lens, in order to meet at the focus given for one distance of the object. If the distance is altered, the focus becomes longer or shorter; and as the angle at which different rays are refracted remains nearly the same, they cannot meet at the new focus, and they form two images. If the visual and photogenic rays were refracted parallel to each other, in coming out of the lens they would always coincide for every focus; but this is not the case.

It seems, therefore, impossible that lenses can be constructed in which the two foci will agree for all the various distances, until we have discovered two kinds of glasses, in which the densities will be in the same ratio as their dispersive power. There is no question so important in photography as that which refers to finding the true photogenic focus of every lens for various distances. I have described the plan I have adopted for that purpose; by means of that very simple instrument, every photographer can always obtain well-defined pictures with any object-glasses. But there is another method of ascertaining the difference between the two foci, which has been lately contrived by Mr. G. Knight, of Foster-lane, London. That gentleman has been kind enough to communicate to me the very ingenious and simple apparatus, by which he can at once find the exact difference existing between the visual and photogenic

focus, and place the Daguerreotype-plate at the point where the photogenic focus exists. I am very glad he has entrusted me with the charge of bringing his invention before the British Association. For the scientific investigation of the question Mr. Knight's apparatus will be most valuable to the optician, as it will afford him the means of studying the phenomenon with mathematical accuracy.

Mr. Knight's apparatus consists in a frame having two grooves; one vertical, in which he places the ground-glass, and the other forming an angle with the first, destined to receive the plate; the planes of the grooves intersect each other in the middle. After having set the focus upon the ground-glass, this last is removed, and the plate is placed in the inclined groove. Now if a newspaper or any large printed sheet is put before the camera, the image will be represented on the inclined plate; and it is obvious in its inclination the various points of the plate will meet a different focus; the centre of the plate will coincide with the visual focus by its inclination. It will in one direction meet the photogenic focus at a point more or less distant from the centre, if the photogenic focus is shorter than the visual focus, and in the other direction if it is longer. The frame is furnished with a scale of division, having the zero in the centre. When the image is represented on the Daguerreotype, by applying against it another moveable scale of division similar to the other, the operator can find what is the division above or under zero at which the image seems best defined; and after having removed from the camera the experiment frame, and set the focus as usual on the ground-glass, he has only to move the tube of the object-glass by means of the rack and pinion, and to push it in or out, a space corresponding with the division of the scale indicating the deviation of the true photogenic focus; the tube of the object-glass is for that purpose marked with the same scale of division.

In order to enable the members of the Association to judge of the merit of Mr. Knight's invention, I have had his apparatus applied to a small camera with which I made my experiment. By exhibiting at the same time Mr. Knight's method and my own, a comparison of the two may be made, and they will be both better understood.

Before concluding, I shall call the attention of all per-

sons conversant with optics to the singular fact I have observed respecting the constant variation of the two foci. I have not been able yet to find its cause, and I leave its investigation to more competent persons. I hope at the next meeting of the Association we shall know more on the subject.

LIST OF IRISH PATENTS.

From July 31, *to August* 6, 1850.

EUGENE ABLON, of Panton-street, Haymarket, in the county of Middlesex, for Improvements in increasing the draft in chimneys of locomotive and other engines.—Sealed July 31, 1850.

JOSEPH BARRANS, of St. Paul's, Deptford, in the county of Kent, Engineer, for Improvements in axles, and axle boxes of locomotive engines, and other railway carriages.—Sealed August 1, 1850.

THOMAS DICKSON ROTCH, of Drumlamford House, in the county of Ayr, Esquire, for An improved mode of manufacturing soap.—Sealed August 1, 1850.

LOUIS NAPOLEON LE GRAS, of Paris, in the Republic of France, Civil Engineer, for Improvements in the separation and disinfection of fecal matters in the manufacture of manure, and in the apparatus employed therein.—Sealed August 3, 1850.

THOMAS KEELY, of the town and county of Nottingham, Manufacturer, and WILLIAM WILKINSON, of the same place, Framework Knitter, for Certain improvements in looped or elastic fabrics, and in articles made therefrom; also certain machinery for producing the said improvements, which is applicable, in whole or in part, to the manufacture of looped fabrics generally.—Sealed August 3, 1850.

JOHN GWYNNE, of Lansdowne Lodge, Notting-hill, Merchant, for Improvements in obtaining motive power, and in applying the same to giving motion to machinery.—Sealed August 6, 1850.

GEORGE AUGUSTUS HUDDART, of Brynkir, in the county of Carnarvon, Esq., for Certain improvements in the manufacture of cigars, and certain apparatus for smoking certain cigars.—Sealed August 16, 1850.

LIST OF SCOTCH PATENTS.

From July 17, to July 29, 1850.

JOHN STEVENSON, of Roan Mills, Dungannon, county Tyrone, Flax Spinner, for Certain improvements in machinery for spinning flax, and other substances.—Sealed July 17, 1850.—(*Six months.*)

JAMES THOMPSON, of Glasgow, in the county of Lanark, Civil Engineer, for Improvements in hydraulic machinery and in steam-engines.—Sealed July 17, 1850.—(*Six months.*)

TEMPEST BOOTH, of Ardwick, in the county of Lancaster, Gum Manufacturer, for Certain improvements in the method of, and apparatus for, obtaining and applying motive power.—Sealed July 19, 1850.—(*Six months.*)

PETER WILLIAM BARLOW, of Blackheath, in the county of Kent, Civil Engineer, and WILLIAM HENRY BARLOW, of Derby, Civil Engineer, for Improvements in the permanent ways of railways.—Sealed July 2, 1850.—(*Six months.*)

RICHARD A. BROOMAN, of 166, Fleet-street, in the City of London, Patent Agent, for Improvements in types, stereotype plates, and other figured surfaces for printing from.—Sealed July 26, 1850.—(*Six months.*)

DONALD BEATSON, of Stepney, in the county of Middlesex, Mariner, for Certain improvements in instruments for taking, measuring, and completing angles.—Sealed July 29, 1850.—(*Six months.*)

JOEL SPILLER, of Battersea, in the county of Surrey, Engineer, for Improvements in cleaning and grinding wheat, and other grain.—Sealed July 29, 1850.—(*Six months.*)

LIST OF ENGLISH PATENTS.

From August 3, to August 22, 1850.

JOSEPH SHAW, of Paddock, near Huddersfield, in the county of York, Cloth Finisher, for Improvements in con-

structing and working certain parts of railways.—Sealed August 3, 1850.—(*Six months.*)

JOHN GWYNNE, of Lansdowne Lodge, Notting-hill, Merchant, for Improvements in obtaining motive power, and in applying the same to giving motion to machinery. —Sealed August 5, 1850.—(*Six months.*)—(Communication.)

FRANCIS KANE, of Berners-mews, in the county of Middlesex, Chair Maker, for Improvements in reclining chairs, in castors for chairs, and other articles of furniture, and improvements in presses.—Sealed August 5, 1850.—(*Six months.*)

WILLIAM CROSSKILL, of Beverley, in the county of York, Civil Engineer, for Improvements in mills for grinding, splitting, pulverising, and crushing grain, bones, bark, ore, and other hard substances, and for grinding paint and other soft substances, and for shelling or removing the skin from rice and other grain, and in machinery for giving rotary motion to mills, thrashing-machines, and any other machine requiring rotary motion to be communicated by any horse or other animal.—Sealed August 6, 1850.—(*Six months.*)—(Communication.)

ALEXANDER MELVILLE, of No. 50, Baker-street, Portman-square, in the county of Middlesex, Gentleman, and EDWARD CALLOW, of Park-road, Stockwell, in the county of Surrey, Gentleman, for Certain improvements in muskets, cannon, and other fire-arms, and in explosive compositions and instruments.—Sealed August 6, 1850. —(*Six months.*)

JOSEPH STEELE, of Chancery-lane, in the city of London, for Improvements in coating and impregnating metals and metallic articles.—Sealed August 9, 1850.—(*Six months.*)—(Communication.)

HENRY MEYERS, of the Strand, in the county of Middlesex, Gentleman, for Certain improvements in power-looms for weaving.—Sealed August 10, 1850.—(*Six months.*)

SELIM RICHARD ST. CLAIR MASSIAH, of Aldermen's-walk, New Broad-street, in the city of London, for Improvements in the manufacture of artificial marble and stone, and in treating marble and stone.—Sealed August 10, 1850.—(*Six months.*)

Alfred Holl, of Greenwich, in the county of Kent, Engineer, for Improvements in steam-engines.—Sealed August 12, 1850.—(*Six months.*)

Arnaud Nicolas Freche, Merchant, residing in the city of Paris, for Improvements in obtaining power.—Sealed August 12, 1850.—(*Six months.*)

Charles Cadby, of Liquorpond-street, in the county of Middlesex, Piano-forte Maker, for Improvements in stringed musical instruments.—Sealed August 12, 1850.—(*Six months.*)

George Thompson, of 12, Park-road, Regent's-park, in the county of Middlesex, Gentleman, for Certain improvements in machinery and apparatus for cutting, digging, or turning up earth, applicable to agricultural purposes.—Sealed August 12, 1850.—(*Six months.*)

Samuel John Pittar, of Church-place, Clapham, in the county of Surrey, Engineer, for Certain improvements in umbrellas and parasols. — Sealed August 13, 1850. — (*Six months.*)

Peter Claussen, of Great Charlotte-street, Blackfriars, in the county of Surrey, Manufacturer, for Certain improvements in bleaching, and in the preparation of materials for spinning and felting, and in yarns and felts.—Sealed August 16, 1850.—(*Six months.*)

William Keates, of Liverpool, in the county of Lancaster, Merchant, for Improvements in machinery for manufacturing rollers and cylinders used for calico printing and other purposes.—Sealed August 16, 1850.—(*Six months.*)

Charles Heard Wild, of St. Martin's-lane, in the county of Middlesex, Civil Engineer, for Improvements in certain structures for retaining water.—Sealed August 17, 1850.—(*Six months.*)

Henry Holland, of Birmingham, in the county of Warwick, Umbrella-Furniture Manufacturer, for Improvements in the manufacture of umbrellas and parasols.—Sealed August 22, 1850.—(*Six months.*)

Edmee Augustin Chameroy, of Paris, for Improvements in paving streets and other surfaces.—Sealed August 22, 1850.—(*Six months.*)

Frederick Hale Thomson, of Berners-street, in the county of Middlesex, Gentleman, and Thomas Robert Mellish, of Portland-street, in the same county, Glass-Cutter, for Improvements in cutting, staining, silvering,

and fixing articles of glass.—Sealed August 22, 1850.—(*Six months.*)

WILLIAM DICK, of the city of Edinburgh, Professor of Veterinary Medicine in the Edinburgh Veterinary College, for Improvements in the manufacture of steel and gas.—Sealed August 22, 1850.—(*Six months.*)

BENJAMIN ROTCH, of Lowlands, in the county of Middlesex, Esquire, for A factitious saltpetre, and a mode by which factitious saltpetre may be obtained for commercial purposes.—Sealed August 22, 1850.—(*Six months.*)—(Communication.)

WILLIAM EDWARD NEWTON, of Chancery-lane, in the county of Middlesex, Civil Engineer, for Improvements in refining gold.—Sealed August 22, 1850.—(*Six months.*) (Communication.)

WILLIAM EDWARD NEWTON, of Chancery-lane, in the county of Middlesex, Civil Engineer, for Improvements in the construction of ships' magazines.—Sealed August 22, 1850.—(*Six months.*)—(Communication.)

WILLIAM EDWARD NEWTON, of Chancery-lane, in the county of Middlesex, Civil Engineer, for Improvements in machinery or apparatus for producing ice, and for general refrigerating purposes.—Sealed August 22, 1850.—(*Six months.*)—(Communication.)

WILLIAM EDWARD NEWTON, of Chancery-lane, in the county of Middlesex, Civil Engineer, for Improvements in the construction of ships or vessels, and in steam-boilers or generators.—Sealed August 22, 1850.—(*Six months.*)—(Communication.)

DANIEL ILLINGWORTH, of Bradford, in the county of York, Worsted Spinner, for Certain improvements in machinery for preparing all descriptions of wool, and hair grown upon animals, for the carding, combing, and other manufacturing processes.—Sealed August 22, 1850.—(*Six months.*)

DUNCAN BRUCE, of Paspebrac, in the district of Gaspé, in Canada, but at present in Liverpool, in the county of Lancaster, Esquire, for Improvements in the construction of rotatory engines.—Sealed August 22, 1850.—(*Six months.*)

RICHARD PROSSER, of Birmingham, Civil Engineer, for Improvements in supplying steam-boilers with water, and in clearing out the tubes of steam-boilers.—Sealed August 22, 1850.—(*Six months.*)

and it continued so two years and a-half. The iron produced by the stone coal is stronger, and there is an increase in the quantity. In the furnace No. 2 we got thirty or thirty-two tons per week on the average, and before that we only got twenty-two or twenty-three tons. I was in the employment of the British Iron Company at Abbercarne in 1826 and 1827; I had been on the same works since 1820; they used the cold blast. Mr. Harper built a small furnace to try an experiment with the stone coal; he tried three furnaces, the two last furnaces were larger than the first; the first succeeded, but the larger ones failed—it was merely an experiment. The cold blast only was used.

Cross-examined by *Mr. Sergeant Bompas.*—The large furnace of the British Iron Company was in work altogether about a month or five weeks, and then the hearth was cleared out and repaired and again put into operation. It continued at work as long as I remained there, which was about ten or eleven months, but not in the same way as before. Sometimes it was blown in with all coke, and then some stone coal was put in, and then they left off, perhaps a fortnight; they again applied more and more stone coal, and again discontinued it for a week or a fortnight, but never in any instance did they use all stone coal. In Mr. Crane's No. 2 furnace nothing has been used but stone coal for two years and a-half. No. 3 furnace was put to work about two years ago. No. 1 has been in work about a year and a-half. We began with coke to blow them in: we tried them with all stone coal, but we did not find it answer so well in the larger furnace; we tried six parts of stone coal to one of coke. We have since used half stone coal and half coke, and afterwards two of stone coal to three of coke. The quantity of stone coal has been increased, and the last day we came here it was all stone coal.

Re-examined by *Sir F. Pollock*.—The last time any furnace was in blast at Abbercarne was in 1827; there never was more than one furnace in blast there except the small experimental one. I never saw hot blast or heard it talked of at that time. In Mr. Crane's No. 2 furnace nothing but stone coal has been used for upwards of two years and three months. Mr. Crane had not enough stone coal for all the three furnaces.

David Mushett—Examined by *Mr. Richards.*—I have

been acquainted with the iron districts in this country for the last forty years, and the different modes of manufacturing iron. I was Managing Director to the British Iron Company in 1826: I was at their works at Abbercarne in that year; they were at that time endeavouring to use as much stone coal as could be done with propriety. I think they were using about three-eighths of stone coal to five-eighths of bituminous coal, and at another time nearly equal proportions. Hot blast was not at any time used. The quality of iron produced was forge iron—I should think decidedly inferior for casting purposes. The quantity was moderate. The first four months of the blast they were making two hundred tons of pig iron or castings, which was at the rate of twelve tons per week, and I think the last four months of the blast they made at the rate, upon an average, of twenty-two and twenty-four tons per week, which in these days I consider a very small quantity; it would never pay, because the common charges upon that sort of iron are very high indeed. The iron was not, in my opinion, marketable for any but forge purposes. I think the cost of manufacture for the last four months of the blast was about 6*l*. per ton, and the previous four months about 8*l*. per ton. It never realized 4*l*. per ton. I had great difficulty in finding a customer for it. The only customer I ever met with was the Neath Abbey Company. Mr. Price objected to purchase it on account of its being of so bad a quality. The Abbercarne works were abandoned by my advice about a month after I had them. There was a sleeping rent of 400*l*. per year, which I recommended the Company to pay rather than continue the works. The anthracite is of an intractable nature, and the difficulty of working has been long known in the trade. I never knew before Mr. Crane's patent, of the hot blast being used with anthracite. I have been all my life engaged on the subject of iron. Since Mr. Crane's patent I know of two new works having been established in the stone coal districts, and I have heard of several others. I have tried the strength of Mr. Crane's iron by the experiments that were published by the late Mr. Tredgold, and I followed the same plan as he did, which was, by having a bar of a given length stuck into a wall or building, and a weight suspended to the end so as to give the same degree of pressure throughout. The bar was about one and a-half inches broad by

three-quarters thick. I find, upon an average of Mr. Tredgold's experiments, that the breaking weight of iron of the old manufacture of these dimensions, and tried in that manner, would be 173 lbs., but I found the breaking weight of Mr. Crane's No. 2 furnace, in which all stone coal was used, to be 209½ lbs. The No. 3 furnace, in which two-thirds stone coal was used, 199 lbs., and in No. 1, where only one-third stone coal was used, 180 lbs.

Francis Northall, sworn—Examined by Mr. M. Smith.—I am Furnace Manager to Mr. Crane. I was engaged at the Abbercarne works in 1826. While I was there, there was only one furnace in blast. The fuel we used was partly coke and partly stone coal—the greater part was coke. The only blast we used was cold blast. We tried it from April to February, but it was a total failure. If we had then known what we do now we could have mastered it. We wanted the hot blast. When I left Abbercarne I blew out the furnace, and so it has continued ever since. The iron we made cost very near 6*l.* per ton; the Company lost 2*l.* a ton by it. During the time I have been with Mr. Crane I have attended regularly every day; his process is quite successful; the quality of the iron is excellent. There is no such iron made in this kingdom as the anthracite coal iron made at Yniscedwyn.

Cross-examined by Mr. Rotch.—There was great difficulty in getting the cold blast through the furnace at Abbercrane when it was charged with anthracite, and when we could, the iron was very middling; where there was one or two tons middling there were ten tons bad. The furnace was a very good one, and there would have been no difficulty if we had had the hot blast.

Thomas Strick, Esq., sworn—Examined by Sir F. Pollock.—I am an iron-founder. My foundry is in Swansea Valley. I am acquainted with Mr. Crane's iron. I consider it better and stronger than iron made in the ordinary way. I believe Mr. Crane's process is new. I never heard of hot blast being used with anthracite before his patent. Attempts had been made to use anthracite with cold blast, but they all failed. There are vast districts of anthracite in Wales, and since it has become useful by the application of hot blast, the value of property has increased at least ten-fold.

William Brough sworn—Examined by Sir F. Pollock.—

I am a mineral surveyor and civil engineer, and have been for the last forty or fifty years. For the last twenty years I have followed my profession in Cwm Neath and Cwm Fawey, in Glamorganshire. I am acquainted with the large basin; it extends from Cwm Neath to Pembrokeshire, which is about seventy miles, and its width is about eight miles. I am acquainted with Mr. Crane's invention, and I believe it to be new. Since the patent was taken out, the demand for anthracite has greatly increased, and it has brought speculation into that part of the country to build furnaces to make iron, by reason of the anthracite being made capable of smelting. To the best of my knowledge stone coal had never been tried before Mr. Crane's patent for smelting with a hot blast. I have seen it tried with coal blast, but it did not succeed. I called the public attention to the subject in the public newspapers respecting its great use, that it was a great desideratum if it would smelt iron.

Cross-examined by Mr. Solicitor-General.—In making iron with stone coal and hot blast, the process is nearly the same as when making iron with the cold blast—there may be some difference, perhaps, in the quantities that form the charges. The anthracite sends off very little flame and no smoke. The free coal does not resemble the anthracite; it sends off more flame and smoke, but not so much as bituminous coal. There is no gradation in the description of coal found in Wales, from bituminous to an approximation to anthracite, until it becomes quite anthracite—it is suddenly anthracite; and as you go east it ceases to be so; as you go west it continues to the very end of the basin. The bituminous coal overlies the whole of the anthracite many fathoms, perhaps 200. The anthracite is never found near the free burning coal, it is many fathoms from it. It is never intermixed. The small free burning coal will not coke. It is used for some purposes, but very little where the real stone, called culm, is to be got.

John Arthur sworn—Examined by Mr. Richards.—I am an iron-master and coal-merchant, and have been connected with the iron trade for the last twenty-five years. I purchased of Mr. Protheroe the Pwlfaron Colliery, with other collieries in the same valley. The coal I obtained at Pwlfaron was the anthracite. Until Mr. Crane's patent, I never heard of hot blast being applied

to stone coal in the manufacture of iron. I have heard of its having been attempted to be used with cold blast. I sold the Pwlfaron Colliery to the defendant after Mr. Crane's patent was taken out. Since then the value of stone coal has much increased. I am building works called Bluengeragh and Forch Goch. They are in the stone coal district. I made an attempt some time ago to bring out a concern in the same situation, by a joint company, but not with anthracite; but I failed. I had bituminous coal and anthracite on the same property. When Mr. Crane succeeded in making iron with anthracite, I had no difficulty in finding a company, and now I am erecting the works I have mentioned for that purpose.

Cross-examined by Mr. Sergeant Bompas.—I applied to Mr. Crane before I erected my works, for a license under his patent to make iron with anthracite and hot blast, and he granted me one. I was to pay him a shilling a ton; and if he paid a shilling a ton to Neilson, I was to pay it. I had no agreement with Neilson. Mr. Crane told me if there was any difficulty in getting a license from Neilson he would undertake to get it.

John Crowe sworn—Examined by Mr. M. Smith.—I am a chain-cable manufacturer. I have tested the specimens which I now produce. They are part of those marked C. The diameter of C, is three-quarters of an inch. I tested them with an hydraulic machine. The specimen, C, broke with a strain of 19 tons. The iron which I previously used, made by the old process, broke at 16½ tons. The specimen, B, is of smaller diameter; it broke at 16½ tons. The quality is much better than any iron I have before used.

David Rosser sworn—Examined by Sir F. Pollock.—I am a master smith. I have purchased anthracite iron from the Yniscedwyn Works. I have used it for various purposes. I am acquainted with the properties of iron. I consider the anthracite iron the best I ever saw.

John Taylor sworn—Examined by Sir F. Pollock.—I am a bricklayer at the Calder Iron Works, near Glasgow. Messrs. Dixon are the owners of those works. The hot blast was used there. It was put up under the superintendence of Neilson, about eight or nine years ago. It was made of boiler-plate malleable iron. The pipe for letting in and out the air was nine inches diameter. The

cylinder was about three feet wide, and perhaps ten feet long. It was heated by a furnace below it, and was placed on a brick arch to keep it from the fire. There were two half-moons in the cylinders to spread the air. The highest temperature we ever got was between 300 and 400 degrees. It never exceeded 400. We tried a great many other modes, but they all failed. Mr. Cundy then became manager of the works, and he drew a plan which was quite successful, and has been in operation for the last four years. These experiments were all after Neilson's patent was taken out. We were about two years trying experiments, and they cost Mr. Dixon 5,000*l.* or 6,000*l.* Neilson's invention never succeeded.

William Carpmael sworn—Examined by Mr. M. Smith.—I have for many years paid great attention to the manufacture of iron, and have read the specifications of all patents that have been granted for improvements relating to that manufacture. The first patent wherein the use of anthracite is mentioned, is, I believe, Martin's, which was granted in 1804. In my judgment, by the mode there described it would be impossible to make iron by the use of anthracite. The invention is very ingenious; but it would fail as soon as a blast of air was got upon it. There is no particular blast mentioned; it is described as the "blast;" no other blast than the cold blast was known at that time. I have read the specification of Philip Taylor's patent. The object of this invention was to use carburetted hydrogen gas, for this reason, anthracite or stone coal not containing that property, and other coal possessing that property, he proposed to use them together, and thereby to supply it artificially, in the process of blasting by the ordinary cold blast. This invention, so far as my knowledge goes, was a failure. I have read the specifications of Botfield's, Neilson's and Devaux's patents. Mr. Botfield's invention is to use, with or without the blowing apparatus, heated air. If he uses it without, he has a chimney to get an extra draft, and he conjoins with that the ordinary blowing machinery. Mr. Neilson's patent is for the application of hot air to smelting furnaces generally. He proposes to place between the blowing apparatus and the furnace to be blasted, a vessel, which is to be heated, and he says that the air vessel should increase in dimensions as the furnace to which it applies increases in

capacity or dimensions. The effect of following these directions would be, that, as you increased the internal capacity, you would relatively decrease the heating surfaces.

Mr. M. Smith.—I believe the air is heated by contact with the heating surface, as you have described?

Witness.—Yes—The direction of this specification is simply this:—Make a vessel of the required dimensions, and at one end have an opening for a pipe, through which you blow the air. At the other end you may have a pipe which connects with the twire, which conducts the air into the furnace, and therefore it blows through and through.

Mr. M. Smith.—Without any breaks at all?

Witness.—No breaks or anything of that kind; no necessary contact of the vessel and the current of air passing through it, only parts of the air would be in actual contact.

Mr. M. Smith.—Will the quantity of heat the air obtains diminish according to the increased size of that vessel?

Witness.—Clearly so. It might be illustrated in this manner:—If a blast of air was passing through this Court, or if a room was equally heated of one-tenth the size, the walls in each case being heated—

Mr. M. Smith.—In the latter case the air would be raised much higher in temperature than the air in this Court?

Witness.—Yes.

Mr. M. Smith.—Then by following these directions and increasing the size of the vessel, you would diminish the temperature of the air?

Witness.—Clearly so; and there are no other directions that would lead you to depart from that rule.

Mr. M. Smith.—What degree of temperature, in your judgment, could be obtained by following those directions?

Witness.—It would be difficult to say what temperature; but I should say, as you increase in size you might blow through without altering the temperature of it, if you increased in very large proportions.

Mr. M. Smith.—Now, I will take a receiving vessel, such as would be used in the furnace in ordinary use for the manufacture of iron?

Witness.—Then, if you follow this rule, and made the vessel in capacity equal to the large blast of a smelting

furnace of the iron-works, I should say you would never get 200 degrees, or anything like that, because the vessel would be so very large.

Mr. M. Smith.—Are you aware, Mr. Carpmael, practically from your own knowledge, whether receiving vessels of the hot-air apparatus put up after Mr. Neilson's patent, followed the directions there given, and were in that shape?

Witness.—My information generally goes that he followed the making of large vessels similar to what he describes in his specification.

The Lord Chief Justice.—Neilson did?

Witness.—Yes, my Lord.

Mr. Sergeant Bompas.—I think you said to your own knowledge?

Witness.—My information.

Mr. M. Smith.—Have you ever seen any, Mr. Carpmael?

Witness.—I have never seen one of Mr. Neilson's so applied. I do not think there is one existing in that way.

Mr. M. Smith.—You have never seen one, and you do not believe there is one existing?

Witness.—Yes.

The Lord Chief Justice.—That is, not exactly according to the specification?

Witness.—Not following it, my Lord.

Mr. M. Smith.—What is the plan you have seen adopted of late years as a hot-air apparatus?

Witness.—All tubes in various shapes and forms.

Mr. M. Smith.—For how many years have you seen those tubes in practice?

Witness.—I do not know. I have been at iron-works during the whole time that hot-air blast has been used. I do not know how long I have known tubes; but I have known of Neilson's patent ever since it existed.

Mr. M. Smith.—Have you seen tubes used as that model of Mr. Crane's?

Witness.—I have seen them at Mr. Crane's.

Mr. M. Smith.—Now, in your judgment, are those tubes the same mode as that pointed out in Neilson's patent?

Witness.—Distinctly not; they involve quite new principles.

Mr. M. Smith.—I believe you drew Mr. Crane's specification?

Witness.—I did.

Mr. M. Smith.—Were you aware of the modes of applying hot-air by tubes which you have spoken of, at the time?

Witness.—It was the only mode I knew to be in practice.

Mr. M. Smith.—I believe, Mr. Carpmael, you have been from time to time consulted about the use of anthracite or stone coal?

Witness.—I have been for several years consulted most extensively, both from America and from England—America in particular.

Mr. M. Smith.—Have you known of attempts having been made to use that coal?

Witness.—Yes; I have heard many modes suggested of burning it.

Mr. M. Smith.—Were you aware of any mode of burning stone coal combined with a hot-air blast before Mr. Crane's discovery?

Witness.—Never.

Cross-examined by Mr. Sergeant Bompas.—I have advised all my life on buildings and structures, and as to machinery of every class and kind. I have superintended works and erected works. The first I superintended was Marlow Bridge, under Mr. Millington. I made drawings for the bridge, and superintended the works occasionally. Mr. Clarke subsequently finished the bridge in consequence of Mr. Millington going to America. I was engineer to some salt works in Cheshire, that cost from 180 000*l.* to 200,000*l.* I directed a large portion of the finishing of the works, both as to the canal and the buildings. I am chiefly engaged in patent business, but I am very largely engaged in advising on machinery of various constructions, independent of patents. I have read Botfield's specification. He broadly claims the use of heated air in blast furnaces. He says, "I claim as my patent the use of the additional chimney or chimneys, and the application of rarified air, gas, flame, or heated air, to, at, or near the twire or twires of the blast furnace."

George Cottam sworn—Examined by Sir F. Pollock.—I am an engineer and general iron-founder, and have been connected with the iron trade for the last thirty years. I have never heard, prior to Mr. Crane's patent, of iron being made by the use of anthracite and hot blast. I think it a very useful invention. In 1837, I heard a

paper read at the British Association on the subject of Mr. Crane's invention, and I immediately ordered ten tons of it to try experiments. I try experiments on all new iron. I cast a bar or two of it, and I found it very strong. The average weight at which ordinary iron four feet long and one inch square breaks, is 440 to 445 lbs., but Mr. Crane's iron of the same dimensions broke at 599 lbs. These experiments were made in 1838, and not at all with reference to this trial. On account of the great strength of this iron, it will be found of great advantage in constructing large buildings, as the same strength may be obtained with a saving of 25 per cent. in the weight.

Sir F. Pollock.—That is my case, my Lord.

The Solicitor-General.—May it please your Lordship, Gentlemen of the Jury, I am afraid when the moment arrives at which you will have to deliberate upon your verdict, you will be of opinion that the whole merits of this case might have been laid before you in a much shorter time than has been occupied. I cannot help thinking that a great many matters have been introduced in the course of the evidence which have nothing on earth to do with the point upon which alone your judgment is to pass; and having attended to the course of the statement on the part of my Learned Friend, I was a little at a loss to know how, in the result, my Learned Friend meant to prove many of the facts he has taken great pains to prove. Therefore it has been in the uncertainty of the colour which in one course of the case might be given to it, we have found it necessary to travel to a certain extent into many facts which, as the case is now left, appear to me to be totally immaterial.

Gentlemen, every cause of this description is of importance. It is of great importance that due encouragement should be given to talent, and to genius, and to industry, and, where it takes place, expenditure of capital, in the endeavour to discover and produce useful inventions. We are all interested that fair protection should be given to objects of that nature. But that is not the only point that is of importance in a patent cause. Not only are there persons who spend their time and talent (and their money frequently) in endeavouring to bring before the public useful inventions; but there are others who are exceedingly anxious to intercept the fair course of trade and

commerce, who seek to appropriate to themselves matters in which they have no just right or interest whatever; who seek to appropriate for their individual purposes that in which, if there be any merit in the way of genius, belongs to others, and which the whole public have just as much right to use as themselves. And the important duty which a jury has to perform in a case of this description is, to watch and to ascertain the real character of the case, not to allow any of those speculators who are watching anxiously to get beforehand with their neighbours, and with others engaged in the same trade, to appropriate to themselves a vast deal of merit of which not a shadow belongs to them; who seek to confine to their own advantages a trade which ought to be free.

My Learned Friend seemed to me to desire to carry the cause by the force of the eulogy of his client. I scarcely ever heard so much said of any patriot who had come under my notice, of any great and distinguished character, who had benefited his country half so much as Mr. Crane. Indeed, the encomiums bestowed upon him, and the importance of the part he has acted, I only recollect to be equalled in a very celebrated work with which we have all been lately entertained. I do remember that in the Muffin and Crumpet Punctual and Early Delivery Company, in "Pickwick," there is an eulogy on that Company nearly equal to that which my Learned Friend has bestowed on Mr. Crane; but with that exception I do not recollect ever to have heard so much praise bestowed upon an individual as I have heard from my Learned Friend.

Gentlemen, it is of extreme importance, that you should be very early called to what is the real point of this case, and of Mr. Crane's merits. You will long ago have observed that Mr. Crane has no merit whatever in bringing before the public notice the hot blast. The hot blast was an invention of which Mr. Crane only heard in common with the rest of the public. The endeavour to appropriate stone-coal as an article of fuel in the manufacture of iron, that is an idea which Mr. Crane has no pretence to the merit of having originated; individual after individual had perceived what would be the advantage of using stone-coal as an article of fuel in the smelting of iron, and for a variety of other purposes, long before Mr. Crane had any dreamings on the subject.

That hot blast is an invention which has been brought before the public, not to be limited in its application to this or that particular purpose, not to be limited to furnaces used merely for the making of iron, but applicable to all purposes, all furnaces, all ovens, all apparatus in which great heat is to be applied to articles requiring it for the purpose of their manufacture. Mr. Neilson's patent is not a patent for the manufacture of a particular article by the application of the hot blast. He brings forward to the public the manner in which the hot blast may be erected, and suggests the great use that may arise from the application of that hot blast to furnaces, ovens, and other things. It is essential, therefore, to be borne in mind, that Mr. Neilson has a right to apply his hot blast to all the purposes to which it can be made applicable. He understood too well the merit of his own invention; he was too well apprized of the great extent of its application to state in his specification that it was to be applied only to this or that purpose or manufacture. His statement is, that it is to be applied to the heating of ovens and furnaces, and various other descriptions of works, to which he refers; he has supposed, and justly supposed, that wherever the application of that hot blast can be found to be useful, whether for one purpose or another, as he had the cost, and the labour, and the merit of the invention, he was entitled to participate in the profits. But if I apprehend this case, his patent is not worth a farthing; everybody may have the profit of it but him. One man will find out that it is good to heat an oven for a certain purpose, and that it will operate upon a certain class of fuel. We hear of a thousand descriptions of cases applicable, no doubt, to different purposes. One man will find out that for the making of china, or some other purpose, one description of coal is extremely material to be used; another will find out that a different description of coal is important for another branch of manufacture; and the thousand classes may have, for ought I know, a thousand different applications. But if every gentleman who finds out that the hot blast is good to operate on that coal, may take out a patent for it, what is the use of Mr. Neilson's patent to him? The question here is, what appears to me the absurd pretence, the unfounded pretence, that because Mr. Neilson's patent has been found applicable and useful

in its application to stone-coal, the individual who can first get a patent for that, has a right to exclude all the world, and Mr. Neilson, I suppose, among the rest, from the application of the hot blast to stone-coal. Why stone-coal any more than any other coal that may be applicable to any other manufacture? Pray what is there in Mr. Neilson's patent that is to prevent him, if he thinks fit, applying his hot blast to stone-coal or anything else? Is his patent only that he may apply it to certain fuel, or to a certain description of coal, or a particular description of furnace? By no means; he has a right to apply the hot blast to every description of fuel on which it will operate. And Mr. Crane—the folks engaged in the iron trade having been trying to work stone-coal with cold blast at a certain time—when Mr. Crane, in common with others, formed a guess of what it would do, he runs and gets a patent, gets his Counsel to pronounce the eulogy you have heard, and which is to exclude the rest of the world from the application of this hot-air blast to stone-coal; and all the merit of the greater strength of iron, all the merit of the economy, is, forsooth, not to be applied to poor Mr. Neilson, who invented the hot blast, which is the sole cause of all this, but to Mr. Crane; he is the benefactor to the country that is to extend its commerce so much. And what has Mr. Crane done? He found that attempts were making to manufacture iron from stone-coal; he found there was such a thing as the hot blast. People had endeavoured to manufacture iron from stone-coal by the cold blast, upon which Mr. Crane says, "Oh! I will take the hot blast, and I will apply it;" and iron is made now as before, not the slightest alteration in the materials, not the addition or subtraction of a material, no alteration in the course of the manufacture. There is the furnace as it was before; it had not the benefit of Mr. Crane's genius bestowed upon it, and nothing but the application of Mr. Neilson's patent to it; and there is the iron. That is the whole; no new discovery as to the mode of making iron; no alteration in the course of manufacture, nor in the least degree any alteration in the application of the materials, or the materials themselves, nothing on earth; but the question simply being whether Mr. Neilson's patent may be applied to a mode of making iron perfectly well known

before, and which only failed to make good iron for want of Mr. Neilson's patent.

Gentlemen, I beg your attention to dates when I am considering Mr. Crane's patent and his merit. Mr. Crane's patent is dated in September, 1836. Did Mr. Crane bestow one sixpence, did he spend one hour in any experiment before he took out his patent? There is not a tittle of evidence to show that he did. In September, 1836, he launches his patent, and what does he do? sends for Mr. Neilson's man to erect his apparatus; that apparatus is not put in work, according to the evidence, until December or January after he had got his patent; he knew no more about it, when he got his patent, than any other person in England; he cannot show you that he spent an hour or a sixpence, or that he knew anything about it, except that he had the genius to conceive it was best to get a patent, and then to see if anything could be found out which would support that patent. You have no evidence, (and you may depend upon it you would have had it if the truth or facts had warranted it, or the greatest industry could have furnished it,) you have no evidence that he ever spent an hour, or that it had at all occupied his time, or that he had any knowledge, or genius, or talent on the subject more than the rest of the world; the first you know of him in this respect is getting his patent. What do you know of him then? cannot he erect his own apparatus? No: he applies to Mr. Neilson, gets, as you hear, Mr. Neilson's license, pays Mr. Neilson a remuneration for the use of his patent, and he claims sympathy as being the inventor, and protection because, forsooth, he has rendered the public a service. He talks of the difference in Mr. Neilson's patent (which I shall come to by and by) by these pipes. What has he to do with that? He knows nothing about it; he sends for Neilson's man, M'Kenzie, and gets him to erect the apparatus on Mr. Neilson's plan. They say not the plan described in the specification; we will see that, and also see whether it is material. But he knows nothing about how far the hot blast will answer; he knows nothing about the mode of applying the hot blast, whether the original form in which Mr. Neilson did it or any of the modifications, not the least in the world did he know about it. He sends to Mr. Neilson, or gets M'Kenzie to come and construct his

apparatus. In December, 1836, or January, 1837, he begins to operate; he comes to a stand at first; he begins again in February, 1837, and at a date subsequent to the patent, he being utterly ignorant of all upon the subject, there being not a tittle of evidence to show he was apprised of any one circumstance until after he had got this patent. Anything which is said by the gentlemen who are the owners of anthracite property, on Mr. Crane's patent being found of so much value when applied to stone coal, giving as it does increased value to their property—that they should meet and dine together, and drink one another's healths, can have nothing to do with this cause. I have no doubt whatever it would be an exceedingly agreeable thing; you know Englishmen always congratulate themselves upon their good fortune by a good dinner, and now and then, among other things, a little speech, and that took place upon this occasion. But what had occurred to deserve a speech but the ingenuity of getting a patent? He gets a patent for the application of somebody else's patent to a known state of things, and that is his merit. The dates are, therefore, extremely material in investigating the claims of these parties. What is the meaning of Mr. Crane getting Mr. Neilson's license? I suppose my Learned Friend is instructed to say, why it was better to be free from all doubt, it was better to pay a sum to Mr. Neilson than to have any litigation. Much better, I admit it would have been, beyond all doubt, to have given credit where it was justly due; but what is the nature of the payment? A shilling per ton. Mr. Neilson has nothing to do with this, this is not his patent plan. Mr. Crane, who has abundance of merit as a man of genius and an inventor, and a patriot, and a benefactor to the public, is also privately extremely generous of having nothing to do with Mr. Neilson's patent; he is kind enough to give him a shilling a ton for all the iron he makes on the application of the hot blast.

Now I beg you to attend a little to Mr. Crane's acts, and contrast them with the advocacy of his counsel. Whoever wishes to oppose a patent, somehow or other it does so happen that as soon as they read the specification all their ideas, if they are opposed to patents, become confused, and I never saw a man against a patent who could understand the specification; he will

always turn everything upside down; he knows it is written by a man of genius and of science; in all probability he brings to bear the same genius and the same science, but when he reads the specification, instead of applying his knowledge as he would do if he set to work about it, he continues to misunderstand every part of it, and to forget all those general directions, all those general principles with which those who drew the specification would take for granted it would be read. Specifications are not drawn for persons wholly ignorant of the subject, they are drawn in the expectation that they will be read by men who bring some knowledge of the general principles applicable to the subject, and who have also the same practical knowledge and experience to guide them in the execution of the work. What, if a man says you are to increase the size of your cylinder, witnesses will be sure to increase it in the very figure and form which is the least useful, and will judge of its merits by that form which they choose to assign to it; each witness instead of applying his honest judgment to the case, his practical experience, his knowledge of what is required and the mode of obtaining it—instead of doing that, he reads it, and he gives you a figure and a form which never could have been dreamt to have been in the mind of the framer of the specification, and which is wholly unsuited to the subject. Mr. Neilson announces to the world that the application of the hot blast will be of very great advantage, and Mr. Neilson's patent appears certainly to have much more claim on public attention than a great many of the patents which are obtained; and you will be so good as to bear in mind that everything you have heard upon the subject of the improvement in the manufacture of iron is to be referred, not to any discovery subsequent to Mr. Neilson's, but the mere application of Mr. Neilson's patent, which, in the common course of events, will be found to be extending its application to materials which before were not susceptible of manufacture without such aid, but which are likely to be brought into operation now. I dare say it yet remains for a vast many articles to be discovered that may be usefully operated on and brought into manufacture by Mr. Neilson's patent. When the attention is once drawn to the hot blast, and various effects produced beyond what was expected, no doubt a variety of persons, each in his turn, will be seeking to

THE

REPERTORY

OF

PATENT INVENTIONS.

No. 5. Vol. XVII. ENLARGED SERIES.—MAY, 1851.

Specification of the Patent granted to Langston Scott, *of Moorgate-street, in the City of London, Wine Merchant, for Improvements in a Mode or Modes of Preparing Certain Matters or Substances to be used as Pigments.*— Sealed July 24, 1850.

WITH AN ENGRAVING.

To all to whom these presents shall come, &c., &c.— The invention consists of improvements in the manufacture of oxides of zinc, or white zinc, to be used as pigments. And in order that the invention may be most fully understood and readily carried into effect, I will proceed to describe the means pursued by me.

Description of the Drawings.

Fig. 1, shows two sections of a furnace and apparatus arranged according to the invention.

Fig. 2, shows a section of a building showing the chamber into which the oxides of zinc are received from the furnace, of the description shown on a larger scale in the previous figure. *a*, is a retort, of clay, made in a similar

manner to clay retorts used in the manufacture of gas, but with only a small hole at each end. This retort is bedded in sand, or it may be broken pumice or other matter (in a fine granular state) not fusible at the heat required, and the manner of setting the retort and constructing the masonry are clearly shown in the drawing; *b*, are the fire-bars; *c*, the flues leading to the chimney, there being a damper at *e*, to regulate the draught; *d*, *d*, are openings into the flues, closed by bricks; *f*, is an opening through the brickwork into the retort,—on to the inner part of which opening, *f*, a block of zinc is placed, so that as it melts it runs into the retort, and when the block of zinc has been introduced into the opening, *f*, the outer part of the opening is to be closed with a brick or cover, and luted, so as to prevent the passage of air into the retort, but this closing and luting is not absolutely necessary, but I believe it better to do so. The melted zinc flowing into the retort is distilled, and vapour passes out of the opening, a^1, at the end of the retort into the chamber, *h*, there being a door, *k*, opposite the end of the retort, as is shown, and through this door is a hole, k^1, (facing the opening, a^1,) through which a supply of air passes and meets the zinc vapours flowing out of the retort, and the air and vapour pass together from the chamber, *h*, through the passage or flue, *l*, which consists of a metal trough, covered with brick, stone, or slate; and I have found that this opening, k^1, in the chamber, *h*, is sufficient, though only about one inch diameter, for a retort of two feet eleven inches long and nine inches diameter, and I have a cover or valve to this opening to adjust the size thereof. In place of introducing the zinc at the front end of the retort I can introduce it at the back end through the door, *k*, but in such case I cause the zinc to be first made hot, so as not to cool the passage, a^1, when placed therein. There is a slide valve, l^1, to shut off the communication between the chamber, *h*, and the chamber, D, where the products are received. At the lower part of the chamber, *h*, is a shoot with a slide valve, *i*, by which any heavy oxides which may deposit there may be withdrawn from time to time. The opening into the lower part of the chamber, *h*, is kept luted and air-tight when working the apparatus; D, is a chamber which with the flue, *l*, I prefer to be composed of iron zinced, but other material may be employed. The lower part of the cham-

ber, D, is made into a series of funnels, there being tubs or other vessels placed below to receive the white zinc in a dry state, the white zinc falling through cloth or other flexible tubes fixed to the lower part of the funnels. The upper part of the chamber, D, I prefer to form into a very shallow cistern, to contain water or to have water constantly flowing over it; E, is an outlet into the open air, there being a fine wire gauze over the entrance from the chamber, D, to intercept any white zinc which may be carried up by the draught. There will, therefore, be a constant current through the chamber, D; but such current will be moderate, and only suitable for carrying off the atmosphere after acting on the zinc vapours. By this arrangement the process of manufacturing white zinc will be rendered very simple.

Having thus described the nature of the invention, and the manner of performing the same, I would have it understood that I am aware that various means have before been resorted to for vapourizing zinc and oxidizing the same by atmospheric air, and I do not therefore claim the same, but only the improvements of apparatus herein described. And I would state that I do not confine myself to the precise details herein shown and described, as the same may be varied without departing from the improvements, so long as the peculiar character of any part of the invention be retained.

What I claim is,

First, the setting or bedding a clay retort in sand or other granulated matter, as above mentioned, when used for making white zinc.

Secondly, I claim the mode herein described of supplying zinc into the retort.

Thirdly, I claim the mode herein described of arranging or combining the chamber, *h*, the flue, *l*, and means of supplying air, as explained; and,

Fourthly, I claim the arrangement of apparatus for drawing off the white zinc in a dry state.—In witness, &c.

LANGSTON SCOTT.

Enrolled January 24, 1851.

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which allows the teeth to move without taking into each other.

This moveable part of the piece, B, is composed of toothed plates or surfaces similar to those described in the hand-machine attached to the iron-piece, C', one end of which rolls upon the axis, P, and the other end upon the rod, H, where it will be seen there is a cord or chain which passes over a pulley, K, and to the end of the cord is suspended the weight, L, which brings back the moveable piece, C, over the cylinder. The banana is to be placed upon the piece, M, which is an inclined plane, and from thence is passed between the teeth of the cylinder and the piece, B. E, is a wedge-piece, which extends the whole length of the cylinder, and to which are attached spiral springs, E', and guides, *e*; this piece is drawn down upon the banana (already introduced between the teeth) by a flexible cam, F, attached to the cylinder, which causes it to enter between the teeth, and then by the action of the spring it is raised again; at each revolution of the cylinder the cam acts upon the wedge-piece, E, to aid in forcing between the teeth a fresh portion of the banana. This machine is mounted upon two pieces of wood, which are firmly fixed to the masonry, so as to give a solidity, and it is preferable to place the machine across a canal. I, are two metal cross-pieces to which the piece is bolted, as shown. To facilitate the labour of separating the filaments and the pulp, water is of great assistance with the greater part of the textile plants. A pump may be so arranged and worked by the power of the engine, and caused to throw water constantly upon the cylinder, and this water will carry away into the canal under the machine the pulpy matter which may accumulate in the lower reservoir, O, and these matters may be afterwards withdrawn, and dried in the open air, and will be found to be useful as a fuel.—In witness, &c.

ALBERT DUMMLER.

by side on the bars or rods, *e*, *e*, which are arranged and held in a suitable position for receiving such coils, and in this manner may one or more layers of coils be obtained; and in this manner may a mass of iron be made into what may be called a pile or faggot, and which is then to be heated, hammered, and rolled into the desired form of bar or plate, and it will be evident that by this mode of piling or faggotting, the grain will be laid in very varied directions. The rod or bar, *h*, which is to be coiled, is conducted over the guide, *i*, which travels or slides on the side framing, as shown, then under the guide, f^1, on the lever, *f*, and the end is held securely by the screw-clamp, *j*, which embraces the series of bars or rods, *e*, *e*, all which will be readily understood on examining the drawings. The pin or driver, d^1, in its revolution comes in contact with the clamp, *j*; hence when the axis, *b*, rotates it will cause the series of longitudinal rods or bars, *e*, *e*, to rotate, and to wind coils of the other bar or rod, *h*, around them, but the bar or rod, *h*, so wound in coils, being moved progressively, the workman guiding it by the aid of the lever, *f*, and guide, *i*, i^1, being a lever carried by the guide, *i*, which is held down by the workman over the bar, *h*, whilst the coiling takes place to keep it in its proper position; and when the winding on has been accomplished to the full extent in one direction, the course of the winding must be reversed, and so on till the desired extent of coiling has been obtained, and the angle at which the coils are laid on the bars, *e*, *e*, may be governed and varied by the moveable guide-plate, i^2, carried by a screw-pin on the guide, *i*.

Fig. 5, shows an end view; and

Fig. 6, a longitudinal view of a piled or faggotted mass, according to my invention, in which there are seven cylindrical rods or bars of the same size, wound round with several layers or coils of a rod or bar of a cylindrical form, but the forms of the bars, both interior and exterior of the pile or faggot, may be varied, and the number of the interior rods and coils may be varied, as shown at figs. 7, 8, 9, 10, and 11.

Figs. 9 and 10, show a faggot formed by a number of hexagon bars in the centre, with flat bars coiled around them: and

Fig. 11, shows a faggot suitable for rolling into railway bars, the interior being composed of flat bars having other flat bars coiled around them.

Fig. 12, shows a side, and fig. 13, an edge view of one

of the clamps, *j*, used for holding the ends of the rods or bars, *h*, when the coiling of each bar is commenced.

Having thus described the nature of my invention, and the manner in which the same is to be performed, I would state that I am aware that rods have before been coiled in the manufacture of barrels for fire-arms; I do not therefore claim the same.

But what I claim is,

The manufacture of iron by rolling rods or bars piled or faggotted as herein described.—In witness, &c.

CHARLES HARRATT.

Enrolled March 28, 1851.

Specification of the Patent granted to ROBERT LONGDON, *the younger, of Derby, in the County of Derby, Glove Manufacturer, and* THOMAS PARKER TABBERER, *of Derby aforesaid, Manufacturer of Elastic Fabrics, for Improvements in the Manufacture of Looped Fabrics.*—Sealed September 12, 1850.

WITH AN ENGRAVING.

To all to whom these presents shall come, &c., &c.—Our invention consists,

First, in improvements in the means of narrowing or shaping knit fabrics.

Secondly, our invention consists of improvements in the manufacture of needles used in making looped fabrics in knitting and warp machinery.

Thirdly, our invention consists of a mode of making looped fabrics in knitting machines, or frames with fleece or projecting loops on one side.

Fourthly, our invention consists also of a mode of making knit fabrics with fleece or projecting loops on one side.

Fifthly, our invention consists of a mode of employing india-rubber in looped fabrics, when the india-rubber is employed in an elastic state.

And, sixthly, our invention consists of improvements in the looped fabrics used in making the socks or "uppers" of boots. And, in order that our invention may be most fully understood, and readily carried into effect, we will proceed to describe the means pursued by us.

In narrowing or shaping fabrics in knitting-machines, it

is usual to employ what are called tickling points at the selvages or edges of the work, and generally four or five such points are used at each selvage or edge, where the narrowing or shaping is to take place; and in making the ends of the fingers of gloves and other like work, the work at the end of each finger has to be divided, and made into two scolloped pieces, which require separate pieces of thread to be laid on by hand, the thread-carrier which lays on the thread for making the other part of the finger being put out of action, or is only used for laying the thread for one of the two divided or scolloped ends of each finger. Now, according to our invention, we are enabled to shape or narrow the work by employing a larger number of tickling points, and we carry the work back not only at the selvages or edges, but at the interior of the work, by which there will be no necessity to divide the ends of the work which are to form the fingers of gloves, or other like purposes. In carrying out this part of our invention, we use the ticklers in two rows; those which are to work at the selvages or edges (for which purpose we use five points at each edge, or selvage), we bend down into a lower row than the others, so that they may be used without the necessity of bringing the others, which are in an upper row, into action, by which means we are enabled to tickle off the work, when it is desired to do so, at the selvages. In working, we proceed as follows:—Having worked in the usual manner till the shaping or narrowing is to take place, and the course being worked in the usual way, the lower, or selvage, ticklers are brought down on to their needles, and the loops are shifted in the usual manner. In the next shifting of the loops, all the tickling points come into action, the selvage ones bending down their needles a distance equal to that which is between those tickling points and the upper ones, by which the upper ones will come into action on their needles, and they will shift the work therefrom into or towards the centre portion of the work, and in such cases as the ends of the fingers of gloves, or other narrow work, when the narrowing has been obtained to some extent therein, the further working it will not be desirable to bring the selvage tickling points into action, and there will be no necessity for dividing or splitting the work at the end of the fingers of gloves. By these means it will be seen that the workman will be enabled not only to tickle at the selvages, but also at any part or parts of

the body of the work, according to the arrangement of the ticklers, and such shaping or narrowing of the work in the body, as well as the selvages, will be found a great improvement in the manufacture of shaped knit fabrics.

The second part of our invention consists of a mode of giving strength to the stems (beyond where the work comes) of the needles used in the machinery employed in making looped fabrics. Heretofore, in making such needles, the wire employed has been of the same diameter or substance, from end to end, and the flattening of the stems at the back ends weakens them in a lateral direction. Now, according to this part of our invention, we cause each needle to be made of wire of different degrees of thickness, that for making the parts whereon the work comes, being, as heretofore, of the guage desired, whilst the part which is to form the back end of the needle, and to be flattened, is of a stouter guage. In carrying out this part of our invention several modes may be resorted to for obtaining the lengths of wire, each consisting of two degrees of thickness, or diameter, such as reducing a thicker piece of wire, by removing the metal at the part requiring it, to the degree or guage desired, or by drawing down the part desired, by lesser dies. But, we believe, the best and cheapest mode is by chemical action, for which we employ a board, with numerous holes, into which we insert the pieces of wire (each to form a needle), leaving a quantity of each projecting below the board equal to that which is required to make the portion of a needle of the guage desired, and immerse such projecting portion into a solution of sulphate of copper, which we prepare by dissolving one pound avoirdupois of sulphate of copper in each gallon of distilled water, and we, from time to time, examine the progress, till the degree of thinness is obtained to the projecting ends of the wire; and in order to protect the upper ends, which are inserted in the wood, we apply fat as a coating, which is readily done, by having the wood thin, so that the upper end of the wire may project above; and we apply a raised edge all round the board, so as to form a shallow trough, into which we pour melted fat. The wires, thus consisting each of two thicknesses, are then to be made into needles, in the ordinary manner.

The third part of our invention consists of a mode of making looped fabrics with projecting loops, or fleece on one side, in knitting machines. Heretofore it has been

usual in making such fabrics to employ double-knibbed sinkers, one knib of each being lower than the other, the lower knib producing the projecting loops or fleece, by making the loops longer than the others. Now, according to this part of our invention, we employ ordinary sinkers, together with needles, alternately having long and short beards, so that, at one time, the presser may press the loops off all the beards, and at another time only off the beards of every alternate needle, by which the loops on the needles having long beards may be knocked over the needles with the shorter beards, receiving and holding the work. In working, the loops for the body of the work are produced in the ordinary manner. The fleece (or projecting loops) is then produced by laying the thread in the ordinary manner, and drawing the jacks and lowering the lead sinkers, as usual; then press the needles whilst over the arch, and by bringing forward the work it is pressed off every alternate needle, that is, off every needle having a long beard, and the work will be received by, and held by, the needles with the short beards. The working is continued in the ordinary manner till the next row of fleece is desired, and the working above described is to be repeated. Heretofore, in making like descriptions of fleeced fabrics in knitting-frames, the fleece has been attached to every needle, but in this it is produced on every alternate needle, and the result is that a finer and more elastic fabric is produced.

Fourthly, our invention consists of a mode of making fabrics in knitting-machines, such fabrics having a ribbed appearance on one side. For this purpose we employ sinkers, each with two knibs of a like length, together with needles having long and short beards, as before explained, and two threads are used, either of the same or of different sizes, and of the same or different colour or material. The course is worked in the usual manner of double-knibbed sinkers, except that the pressing is twice in each course, once over the arch, and once off the arch. In pressing over the arch the front loops are pressed off the long-bearded needles, and the work is caught by the short-bearded needles only. The back thread is brought under the long beards, the frame is then thrown up, and, in so doing, the back thread is moved behind the short beards, and the course is worked in the usual way. The fabric thus produced has ribs or stripes (according to the materials used) on one side, and a satin appearance on the other.

The fifth part of our invention consists of a mode of employing india-rubber in knit fabrics, when the india-rubber is employed in the elastic state, such, for instance, as in the state of what is called Vulcanized. Heretofore, in introducing india-rubber into knit fabrics, it has been usual to employ the india-rubber in a set or inelastic state, and to obtain elasticity thereto by heat, by which the work contracts considerably; and it has also, in some cases, been the practice to use india-rubber in the elastic state, when introducing it in the progress of making knit fabrics; in doing so, however, the strands are not stretched, so that the work, when it comes out of the machine, does not contract, or contracts very little. Now it is desirable that the work should contract considerably, and the object of this part of our invention is so to introduce india-rubber in its elastic state, that it may be stretched to the desired extent, and be worked into the fabric in the stretched state, and so that it may cause the work to contract to the extent desired.

Description of the Drawing.

Fig. 1, shows a section of so much of a knitting-machine as will enable us to describe this part of our invention.

Figs. 2 and 3, show two views of a thread-carrier, for introducing a strand of india-rubber; and fig. 4, is a plan thereof. The thread-carrier is a tube, down which the strand of india-rubber proceeds, and is delivered at the lower end; *b*, is a rod, through the tube, *a*, there being an eye through the rod for the passage of the india-rubber; the rod, *b*, is carried to and fro with the thread-carrier, and so long as the eye or opening therein is away from the sides of the tube, the india-rubber will pass through freely; but immediately the rod is drawn to one side, the india-rubber is held securely thereby. The further movement of the thread-carrier will cause the india-rubber to be stretched for a distance, equal to that which the thread-carrier passes over after the holding of the india-rubber, and the extent of stretch given to the india-rubber may be regulated by the workman; and the best means we are acquainted with for effecting this object is to attach a cord to each end of the rod, *b*, the cord hanging slack so long as the india-rubber is to be delivered freely, and becoming straight and tight when the india-rubber is to be held, so that although the rod is allowed to move with the thread-carrier, the rod is retained tight during the further movement; and to prevent

the needles being drawn together, the points, *c*, are used, fixed to the rafter. The india-rubber, in other respects, is laid on in the ordinary manner, and worked into the fabric.

The sixth part of our invention consists of a mode of making a compound elastic fabric for the "uppers," or socks of boots. For which purpose we may make the "uppers," or socks of boots, by knitting, and we produce an elastic band, at the upper part, as heretofore, to which we make no claim, this part of the process being already the subject of a patent, but we combine with the elastic stocking fabric portions of elastic fabrics, containing india-rubber, and which we prefer to be made according to the means hereinbefore described. This will readily be understood by reference to the drawing, where fig. 5 shows a side view of a boot complete, the lines showing the position of the elastic india-rubber fabric within the looped stocking fabric, of which the sock or "upper" of the boot is composed, the india-rubber portion of the compound fabric giving strength to the whole over the ancles of the wearer.

Fig. 6, shows an interior view of the "upper," lined at the parts *a*, *a*, with brown holland, or other suitable fabric, the parts *b*, *b*, being lined with india-rubber elastic fabric; and the compound looped fabric, thus produced, will have strength of elasticity over the ancles. These portions, *b*, *b*, are sewn to the inelastic parts of the lining, the inelastic lining having spaces cut out to receive the elastic portions of the lining. The effect of using this compound fabric will be that, externally, the foot and ancles will appear to be covered by a sock, and the looped fabric of the sock will, by combining it with the use of india-rubber fabric on either side of the upper part of the foot, have stability given to it, which will be found to be a great improvement in the looped fabrics thus used in making the socks or "uppers" of boots.

Having thus described the nature of our invention, and the manner of performing the same, we would have it understood, that we do not confine ourselves to the details herein described, and the same may be varied without departing from our invention, so long as the peculiar character of any part of our improvements be retained. But what we claim is, first, the improvements herein described in the means of narrowing or shaping knit fabrics.

Secondly, we claim the improvements in needles used in machines employed in the manufacture of looped fabrics.

Thirdly, we claim the mode herein described of making knitted fabrics with fleece or projecting loops on one side, produced by the alternate needles.

Fourthly, we claim the mode of making knitted fabrics with a ribbed appearance on one side, by the employment of needles with long and short beards, in combination with two-knibbed sinkers.

Fifthly, we claim the mode of making looped fabrics with india-rubber therein, as herein described.

And, sixthly, we claim the mode of making the socks or "uppers" of boots, as herein described.—In witness, &c.

R. LONGDON.
THOMAS PARKER TABBERER.

Enrolled March 12, 1851.

Specification of the Patent granted to FREDERICK WOODBRIDGE, *of Old Gravel-Lane, in the County of Middlesex, Engineer, for Improvements in Machinery for Manufacturing Rivets, Bolts, and Screw Blanks.*—Sealed September 5, 1850.

WITH AN ENGRAVING.

To all to whom these presents shall come, &c., &c.—My invention consists of a mode of combining mechanical parts into a machine for manufacturing rivets, bolts, and screw blanks; and in order that my invention may be more fully understood, and readily carried into effect, I will proceed to describe the means pursued by me.

Description of the Drawings.

Fig. 1, is a plan of the machine, some of the parts being removed.

Fig. 2, is a side elevation.

Fig. 3, is an end view, the end of the trough being removed to show the die partly in section; and

Fig. 4, is a transverse section of the machine, constructed and combined according to my invention. *a*, is a shaft which receives motion from a steam-engine, or other power, and by means of the pinion, *b*, gives motion to the cog-wheel, *c*, fixed on the axis, *d*, on which is fixed the mitre-

wheel, *e*, which takes into and drives mitre-wheel, *f*, on the axis, *g*, on which is fixed the pinion, *h*, which takes into the teeth of the wheel, *i*, which is fixed on the axis, *j*; and, on that axis, *j*, is also fixed the disc, *k*, which, through its face, carries a series of dies for cutting off and receiving a series of blanks, to have heads formed thereto, by means of suitable headers or dies carried by the wheel, *i*; and the wheel, *i*, and disc, *k*, carrying their respective dies, revolve in a trough of water, so that each die, after being used in making a rivet or bolt, or screw-blank, will be immersed in water before being again used. The dies, k^1, carried by the disc, *k*, consist of tempered steel or chilled cast-iron, and they are fixed in or through the face of the disc, *k*; and there is a heading die, i^1, for each disc, k^1, and such heading dies are carried by, and slide freely through, the wheel, *i*, and the pairs of dies, i^1, k^1, come into and go out of action in regular succession. As hereafter described, k^2, is a friction band on the face of the teeth of the wheel, *i*; such friction band is to prevent the wheel, *i*, moving, except when driven at intervals by the pinion, *h*, which has only three teeth thereon, as shown, but other means of giving motion to the parts may be resorted to. The disc, *k*, is retained correctly in position by means of a lever catch, *l*, with a wedge-formed tooth, which enters in succession into the angular notches on the periphery of the disc, *k*, and it is caused to do so by the cam, *m*, on the axis, *g*, lifting the other end of the lever at proper intervals. In order to feed the dies, k^1, a rod of iron or other metal, according to the nature of the article to be made, which is well understood, is to be introduced between the rollers, *n*, *n*, which are graved together, and they receive motion by the connecting rod, n^1, from the crank pin, n^2, on the axis, *d*, the other end of the connecting rod being attached to a crank, n^3, moving freely on the axis, and carries a fall or driver, n^4, which takes into, and drives the ratchet-wheel, n^5, fixed on the axis of the lower roller, *n*, by which the rollers, *n*, *n*, will, at intervals, be moved, so as to force a portion of the rod into the die, k^1, which may, for the time being, be in position to receive the same. *o*, is a plate with a groove in it, against which the rod of metal rests, and it forms a cutter, against which the rod is pressed by the die, k^1, in its movement after receiving the end of the rod; and it is by this means, that is, by a die, k^1, and the plate, *o*, that the length is cut off to form a rivet bolt, or screw blank, according as the dies, i^1, k^1, are suitable for the

one or other of those articles. The piece of metal thus cut off, is carried forward by the rotation of the disc, till the next die, k^1, comes into position to be fed; and then the heading die, i^1, of the die, k^1, which has been fed, will be brought into action, and be pushed forward, by means of the bolt, p, which slides in suitable bearings, as shown, the bolt, p, being actuated by means of the excentric, p^1, on the axis, d; and immediately after a heading die, i^1, has so been forced up, it comes into position for the finger, q, to move it back, the finger, q, taking hold of the projection on the back end of the heading die, i^1. The finger, q, is carried by the sliding bolt, q^1, which slides in suitable bearings, as is shown, and the bolt, q^1, receives motion by the connecting rod, q^2, connected to it and to a crank-pin on the axis, q^3, which axis receives motion from the axis, d, by means of the cog-wheels, q^4, q^4, as shown. The bolt, q^1, by the finger, q^4, gives motion to the clearing punch, q^5, which slides in suitable bearings; and this punch clears the die, k^1, by forcing out the articles which have been headed therein, and those articles fall down the fixed inclined plane, q^6. The heading dies are again brought into position by means of the fixed inclined plane, r.

Having thus described the nature of my invention, and the manner in which the same is to be performed, I would have it understood that I do not confine myself to the precise details as herein shown and described, as the same may be varied, so long as the peculiar character of my invention be retained; and I make no claim to any of the mechanical parts separately. But what I claim is, the mode herein described of combining mechanical parts into a machine for making rivets, bolts, and screw blanks.—In witness, &c.

FREDERICK WOODBRIDGE.

Enrolled March 5, 1851.

Specification of the Patent granted to EDME AUGUSTIN CHAMEROY, *of Paris, for Improvements in Paving Streets and other Surfaces.*—August 22, 1850.

WITH AN ENGRAVING.

To all to whom these presents shall come, &c., &c.— The invention consists of improvements in paving roads and

surfaces by means of a combination of materials formed into blocks or forms, to be used for making roads and other ways, and also may be used for floors of barns and for other surfaces; and it consists of the use of straw and the stalks of other vegetable matter impregnated with bituminous, resinous, asphalted matters, also with fatty or oily matters, as will be afterwards described.

The improvements in making roadways are of two descriptions, although the same materials are used. The foundation of the road is first to be prepared in a solid form, being somewhat rounded in the centre. I then place upon the ground, either lengthways or across, two pieces of wood, A, shown at fig. 9; these pieces are separated from each other and kept apart by the bolts, B, B, which serve at the same time to adjust the partitions, C, C, which are of strong metal, by means of which are formed the cases, D, D; into one of these cases is placed a press composed of a frame, E, E, upon which is mounted a screw, F, at one of the ends of which is a square, G, to receive a handle, and at the other end an iron plate, H. I then take a quantity of straw or other vegetable fibre, previously crushed by pressure, and afterwards placed in a bath of bituminous or oily or fatty matter so as to cover them completely; I then place a sufficient number of these straws thus impregnated in an upright position in the case, so as to fill it next to the one where the press is placed. The screw, F, is then to be worked so as to force up the plate, H, against the partition, C, and to press the mass of straw, I. This pressure forces out all the superfluous bituminous matters, and combines the vegetable fibres into a solid homogeneous mass, capable of bearing the weight of heavy carriages. When the matters have been sufficiently pressed, the press is to be removed into the next case, and the same system pursued until the whole of the frames are filled; the apparatus is then to be removed to the next row, and the earth arranged as before, and the same system pursued until the whole of the roadway is covered.

Another mode of using these materials for paving surfaces is to form them into bricks or blocks, and to pave the roads or surfaces with them. The machine with which I prepare these blocks is as follows:—A, a cylinder, in which is a piston, B, which is worked by steam or other power; to the piston, B, is attached a rod, C, which passes through a stuffing-box, D, which is well luted; the other end of this

rod enters into a mould or hollow cylinder, E; this cylinder is placed upon a table or frame, and is secured thereto by means of side pieces, G, G. In the interior of this mould is a flat bottom of iron, H, which may be removed, and its place supplied by a partition, I, which is fixed by means of the two keys, J, J; in using this machine the straws or vegetable matter are first cut or broken, and the quantity arranged according to the size of the blocks required; they are then to be immersed in a bottle of bituminous material, after which they are to be placed in the mould, E, in such manner as to fill it, when the piston is set in motion, and by which the piece, F, is caused to act against the straw, K; I then stop the action of the piece, F, by means of the keys, J, J; the piston is then to be withdrawn; the effect of this pressure will be to force the vegetable matter into a solid mass; in order to remove this mass the mould is to be turned round, and the opposite end brought into contact with the piston, B, at fig. 5. I then place a plate of metal, L, between the rod, C, and the mass of straw, K, the ends of which appear; the piston is then again put in motion, the return of which will force out the block. In order to prevent its being broken as it is forced out of the mould, there are two wires, M, M, seen at figures 5 and 6. It will be evident that although I have spoken of the means of making bricks and blocks, that other forms may be made dependent upon the shape of the mould through which they are to be passed. In order to remove the unpleasant odour arising from the bituminous matters, the following arrangements may be used:—I use an apparatus which is to be arranged upon the ground, and it is constructed in the form of a trough of metal, which is shown at the figs. 7 and 8, in which is placed a small fire-place, filled with combustible matter, P; at the lower part of this fire-place is a partition, D, which runs the whole length of the apparatus. This partition forms a division in the trough, which is constantly kept heated to a high temperature; in this manner the volatile oils which the bitumen contains are heated from the surface of the earth, and dried at that point which causes the odour to disappear.

In the drawing sheet, 2, I have shewn another arrangement of machinery employed by me for the preparation of the materials to be used for paving, &c., the various views of which are shewn at figs. 1, 2, 3, 4, and 5, in which the same letters are used for the same parts. A, is a fire-place,

over which is an iron vessel, B, the sides, C, C, of which incline outwards at the upper part. D, is a wooden piston placed in the vessel, the piston rods, E, of which pass through the side of the vessel, and are screwthreaded. F, are supports with female screws, through which the threaded parts of the rods, E, pass. G, is the masonry on which the machinery rests. H, H, is a cover pierced with holes, which is placed in the vessel, B, about the centre of the sides, C, C; it turns upon an axis, I, so as to be capable of being opened and closed. The axis, I, is supported so as to turn in the two ends of the vessel. J, is a mould formed of three sides; L, is a band or plate, which serves to close the opening of the mould. M, is a pin, which serves to hold the band or plate, L, by crossing the two sides of the mould. N, a key, to keep the cover, H, firmly closed. O, is a groove at the bottom of the vessel in which works the bolt M. P, represents the liquid bitumen in the vessel. Q, is the straw, and R, the straw and bitumen when pressed into the mould. S, the combined piece when removed from the mould. The mode of operating with this machine is as follows.

The fire-place is first heated so as to melt the bitumen placed therein; when that is done I open the cover, H, and throw in the straw or other suitable material, as shown at fig. 2; the cover is then to be closed, as seen at figs. 2 and 3, and kept firm by the keys, N. The piston-rods are then put in motion by turning the wheels thereon, causing the pistons to press forward the material into the mould, where it remains compressed; to keep the matters compressed, I place the piece, M, against the band, L. The piston is then to be drawn back and the cover, H, removed, in order that the mould may be taken out and allowed to cool. When the pressed material is taken out and is ready for use, it may be divided into any required lengths.

I have also found that the arrangement of apparatus shown in the figs. 6, 7, 8, and 9, of the drawing sheet, 2, well adapted to compress the matters together after they have been suitably combined. T, is a metal cylinder, one part of the surface of which is smaller than the other, as shown at U, U[1]; V, V, is a bed-plate, with partitions, X, X, forming troughs; Y, Y, are the thin metal moulds placed within these troughs; Z, shows the straw and bitumen, being compressed by the surfaces, T. With this arrangement long lengths may be readily prepared.

Having thus described the nature of my invention and

the manner of performing the same, I would have it understood that I do not confine myself to the precise details given, so long as the peculiar character of the invention be retained.

But what I claim is,

The mode of paving roads and other surfaces by a combination of materials, as herein described.—In witness, &c.

EDME AUGUSTIN CHAMEROY.

Enrolled February 22, 1850.

Specification of the Patent granted to HENRI JEREMY CHRISTEN, *of Paris, in the Republic of France, Engineer, for Improvements in Cylinder Printing.*—Sealed September 19, 1850.

WITH AN ENGRAVING.

To all to whom these presents shall come, &c., &c.—The invention consists of so printing with cylinders, having the whole of their surfaces engraved, as to leave blank or unprinted spaces on the printed fabric, according to any shape or design. These improvements will be found applicable to all descriptions of cylinder-printing machinery. And the invention consists of placing at the back of the fabric which it is desired to print, a design or pattern hollow and in relief, which will cause parts of the fabric which is to be printed by the engraved cylinder to be pressed in contact with the engraved surface of the cylinder, whilst other parts of the fabric, where the hollows in the pattern are, will not be pressed on, and therefore will not be printed by the engraved cylinder.

In the drawing I have shown—the application of my improvements to a roller machine—D, D, represents an endless fabric, which is placed at the back of the fabric or cloth to be printed; the length of this cloth, D, may be varied according to the design, and the width of it will be regulated by the width of the cloth to be printed. This endless fabric, D, is made by cementing four or other suitable number of thicknesses of cotton or other fabric by a suitable flexible cement (gutta percha cement is preferred); and on to this a surface of woollen fabric is cemented, the pattern of the

plain part, or the part which is not to be printed, being produced by removing or cutting away of parts of the surface of woollen cloth, by which the fabric which is being printed by the engraved cylinder will not be pressed on at those parts, and therefore will be left plain; or other suitable materials may be employed which possess sufficient flexibility. It is not essential that the pattern, D, should be endless; it may when desired be of the same length as the fabric to be printed; or in place of using a fabric, D, a roller or cylinder may be employed, where the extent of pattern will admit of it, hollows being made in the surface thereof where the printing cylinder is not to print the cloth or fabric. The printing is in other respects to be performed in the ordinary manner.—In witness, &c.

HENRI JEREMY CHRISTEN.

Enrolled February 19, 1851.

Specification of the Patent granted to JAMES MATHER, the younger, *of Crow Oaks, Pilkington, in the county of Lancaster, Bleacher, and* THOMAS EDMESTON, *of the same place, Calenderman, for Certain Improvements in Machinery or Apparatus for Scouring, Finishing, and Stretching Woollen, Cotton, and other Woven Fabrics.*—Sealed September 5, 1850.

WITH AN ENGRAVING.

To all to whom these presents shall come, &c., &c.—Our improvements consist in a novel mode of operating upon fabrics, whereby we are enabled to gain in a more efficient manner that appearance which is commonly known as the "beetle," a linen finish, the fabric at the same time having a stretching effect imparted to it, the same principle of operation being also applicable to the "fulling," or scouring, and finishing of woollen cloths; the peculiar character of such operation consisting in the use of a roller, which is caused to move to and fro upon the fabric under operation, in the direction of the width thereof; and in order that our said invention may be clearly understood, we have appended to this our specification certain drawings showing

how the same may be practically applied, which drawings we will now proceed to describe.

Fig. 1, is a side elevation of the machine complete.

Fig. 2, is an end view thereof; and

Figs. 3 and 4, detached views of those parts which immediately affect the operation upon the material. The framework is shewn at *a*, *a*, *a*, and the main driving shaft at *b*, upon which there is mounted a spur wheel, *c*, taking into another affixed to a transverse shaft. Upon this shaft there is a disc, *e*, *e*, having a slot formed therein, which receives a pin, *f*, coupled to a connecting rod, *g*, the other end of which is jointed to one arm of a vibrating framework, *h*. This framework is mounted upon a shaft, *i*, at its lower end, and is connected at the upper part to rods, *j*, *j*, coupled together by a bar, *k*. Upon the inward ends of the rods, *j*, *j*, is mounted the axle of a roller, *l*: as the shaft, *d*, therefore revolves, the crank pin, *f*, will be carried round, and through the intervention of the rod, *g*, cause the framework, *h*, to vibrate upon its centre, and thus impart a backward and forward motion to the roller, *l*, the extent of which motion may be regulated by the situation of the pin, *f*, with its slot. At each end of the framework there is a standard, *m*, within which are placed brasses capable of sliding up and down therein, and which carry the axle of the longitudinal roller, *n*, *n*. The brasses are supported by screws, *o*, which work in nuts affixed to the framework, so that by turning the said screws, the roller, *n*, *n*, may be raised or lowered, and adjusted in a horizontal direction. Upon a cross shaft, *p*, *p*, there is affixed a worm, *q*, *u*, taking into the teeth of a worm-wheel, *v*, which is mounted upon one end of the axle of the roller, *n*. The shaft, *p*, carries a ratchet, *r*, within the teeth of which is a click projecting from a lever, *s*, which lever is mounted so as to turn loosely upon the shaft, *p*. To one of the rods, *j*, is attached a projecting-piece, *t*, which, being thus carried forward simultaneously with the roller, *l*, arrives in contact with the lever, *s*, and by turning it upon its centre, causes the click to turn the ratchet-wheel, *r*, partially round, which movement operating through the worm, *q*, and wheel, *v*, effects a slight revolution of the roller, *n*. Upon the return motion of the roller, *l*, the piece, *t*, will allow the lever, *s*, to be brought back to its former position by the weight, *u*. The operation of this machine is as follows:—The fabric to

be finished is wound upon the roller, *n*, *n*, as shown by the red colour, for which purpose the roller, *l*, is to be kept up, and the handles of the screws, *o*, turned so as to bring the roller, *n*, *n*, downwards, which is afterwards to be again raised, and the transverse roller, *l*, allowed to press by its weight upon the coil of cloth. The main shaft being then put in motion, the crank-pin, *f*, will cause the roller, *l*, to travel to and fro upon the surface of the material wound upon the roller, *n*, at each forward motion, causing the piece, *t*, by its arrival in contact with the lever, *s*, to move the ratchet-wheel, *r*, and consequently impart a slight rotatory motion to the roller, *n*, *n*, so as to bring a fresh portion of the surface of the cloth under the rolling operation, and so on until a sufficient pressing has taken place to effect the required "beetle" or "linen" finish, at the same time, by means of the roller, *l*, travelling in the direction of the width of the fabric, it will become stretched. The cloth to be thus treated may be placed upon the roller, *n*, in a moist or dry state as desired, and previously calendered or submitted to our improved process only. It may be subjected also to the action of heat by causing steam to enter the interior of the roller, or by other suitable means; woollen cloths may be thus treated in order to gain the effect of ordinary hot-pressing. When our improved machine is used for scouring or fulling woollen or other cloths, we cause the roller, *n*, to be placed in a trough, and partly immersed in soap and water or other such fluid, which fluid may be kept at the proper temperature by the application of steam, or by other methods commonly in use for such purposes. By thus scouring the woollen or other goods they will by the same operation be kept stretched in the direction of their width, so as to prevent entirely or in a great measure its being a subsequent operation.

We have thus far described the form of machine which we prefer for carrying out our invention; if desired, however, a flat surface may be substituted for the roller, *n*, the fabric being caused to travel thereon, so as to present fresh points for pressure.

And we would also observe that many modifications of machinery may be employed for embodying the spirit of our invention, that which we claim as secured to us under the above in part recited letters patent, being the application of a roller pressing upon the material and travelling in the

direction of the width thereof, for the purpose of scouring, finishing, and stretching woollen, cotton, and other woven fabrics.—In witness, &c.

JAMES MATHER.
THOMAS EDMESTON.

Enrolled March 5, 1851.

Specification of the Patent granted to WILLIAM FRANCIS FERNIHOUGH, *of London, Engineer, for Improvements in Locomotive and other Steam-engines, and Improvements in Obtaining Motive Power.*—Sealed October 10, 1851.

WITH AN ENGRAVING.

To all to whom these presents shall come, &c., &c.—Now know ye, that, in compliance with the said proviso, I, the said William Francis Fernihough, do hereby declare, that the nature of my said invention, and the manner in which the same is to be performed, are fully described and ascertained in and by the following statement thereof, reference being had to the drawings hereunto annexed, and to the figures and letters marked thereon, that is to say,

First, a peculiar method of warming the feed-water, by a portion of the waste steam.

Secondly, a peculiar method of diminishing the back pressure on the pistons of locomotive and such other steam-engines as produce the draught in the chimney by the waste steam.

In fig. 1, A, represents a cylindrical air-tight chamber, from which the feed-pump draws the heated water at B, the other branch, C, being connected by the ordinary suction-pipe and regulating valve with the water-cistern. The pipe, D, is connected to the exhausting steam-pipe of the engine, at any convenient point, and a cock, E, in this pipe, regulates the flow of the steam, which then passes up, through the cock-valve, F, and ascends through the small holes in the grating, G, up through the feed-water, the steam being sucked through the pipe, D, by the partial vacuum generated in the chamber, A, at each stroke of the pump. The quantity of steam admitted is regulated by the fireman, by means of the lever and rack, H, H, and he gives that

amount of opening to the cock, E, which he finds to admit the proper quantity of steam to warm the water sufficiently. I do not claim the warming of feed-water by means of waste steam condensed in the water, but I claim the peculiar method of warming the feed-water by causing it to pass through a vessel, in which a partial vacuum is formed by the action of the pump, so that a portion of the waste steam is drawn from the exhausting pipe into the vessel, and condensed in the water.

In figs. 2 and 3, A, represents a cylindrical cast-iron case, turned smooth inside, and having two branches, B, B, to which are attached the respective exhausting pipes from the two cylinders. The branches form rectangular ports, C, C, where they enter the case; the upper end of the case is conical, open at the top, D, D. The lower end has a loose cover, E, bolted on to admit the brass valve, F, which is cast in one solid piece, and keyed fast on to the vertical spindle, G. This spindle receives a reciprocating rotary motion by a lever fixed on its lower end, and connected to the rod of an eccentric fixed on the crank shaft. The bottom of the valve, F, consists of a circular disc, H, which, being turned smooth, works upon the smooth upper surface of the lid. This disc has an upright pipe, I, formed at the top into a short blast-pipe, K, which projects the steam up the chimney, whenever one of the wing passages, L, M, N, may be opposite either of the ports, C, C, whilst, when not opposite, the steam from either port has a free escape at D, D. In the position shown in the drawing, the left-hand cylinder is exhausting up the blast-pipe, K, its crank being near to the dead point, whilst the right-hand cylinder is exhausting freely up the space, O, its piston being about the middle of the stroke. Thus, the wing passages, M, N, are alternately brought opposite to the right-hand port, C, at the moment when the right-hand cylinder commences to exhaust, and also the single-wing passage, L, always passes opposite the left-hand port, at the moment the left-hand cylinder commences to exhaust. Thus the pistons exhaust freely into the partial vacuum of the smoke-box during the most rapid and valuable part of the stroke. The brass valve, F, is turned in a lathe, so as to fit the case, A, somewhat slack, in order to diminish the friction, as the consequent leakage will be quite insignificant during the momentary blasts through the ports and wing passages. By using only one wing passage, a continuous revolving motion may be

given to the valve, F, but in this case it must revolve twice during each revolution of the crank-shaft. I do not claim the allowing of a portion of the waste steam to pass up the blast-pipe whilst the remainder escapes freely, but I claim the application of a revolving-valve to the blast-pipe, as described, in such manner that the steam is allowed free escape from the cylinder during a portion of the stroke, and the expansive force of the steam at the conclusion of the stroke produces the blast.

Improvements in Obtaining Motive Power.

First, using the products of combustion from a close furnace, and the steam produced within the furnace, to produce power in an impulsive rotary engine, that which I prefer consisting of two or more arms revolving in a close-fitting circular case, the aeriform bodies entering by a jet in a tangential direction at the circumference of the case, and making their exit as near as convenient to the centre of the case. In some instances, I prefer to cause the rush of the jet to carry air with it, or water in the form of spray, which acts on a turbine, and I sometimes use ordinary steam in the rotary engine, above described.

Secondly, forcing air into the ash-box of the close furnace by means of a fan, which delivers its air all round the circumference of the case through a narrow port, thereby increasing the pressure obtained by means of the centrifugal force of the air revolving in the port. In some cases I apply a steam-jet to the ash-box.

Thirdly, using the aeriform bodies to produce power in a chamber similar to a gasometer, provided with a stuffing-box to retain the water, also sealing the exit-valve by the affusion of water at the time of closing.

Fig. 4, represents a cylindrical close furnace, A, made of plate-iron, and lined with fire-clay on the sides and roof, to protect the metal; B, are the fire-bars, on which the fuel is burnt, as usual. The doors, for access to the fire-box and ash-box, are shown by dotted circles, C, D, and must be air-tight when closed. A higher pressure than the atmosphere is produced in the furnace by forcing air through the pipe, E, into the ash-box, F, by means of a blowing-machine. The products of combustion heat the metal or fire-clay bars, G, G, which are intended to vaporize the water injected upon them through the nozzle, H, by a force-pump; and the steam produced by this process being mixed with more or

less dust, I call it crude steam; no water is to fall on the ignited fuel, and the upward current between the bars, G, G, prevents the spray dropping. Then the products of combustion, together with the crude steam, issue through the jet-pipe, I, into the circular case, K, in a tangential direction, and give motion to the arms, L, L, and their spindle, M, M, and then escape through the annular openings, N, N, round about the spindle into the atmosphere, through the chimneys, O, O. The engine drives its load by means of the belts, P, P, passing round the spindle itself, or round pulleys fixed upon the spindle. These belts pass round large drums, which give motion to the machinery to be driven, or to the wheels of a locomotive, or boat; and, in some cases, the speed is still further reduced by additional pulleys, belts, and drums, in a well-understood manner, so as to suit the speed of the machinery to be driven. The best effect will be produced by so proportioning the engine, that the velocity of the aeriform bodies issuing from the jet-pipe, I, shall but slightly exceed the velocity of the ends of the arms, L, L, in which case, if the pressure in the furnace, A, be about eight pounds per square inch, the centrifugal force of the rotating aeriform bodies in the case, K, will balance about four pounds per square inch, the remaining four pounds per square inch giving the velocity to the aeriform bodies issuing from the jet-pipe, I.

Fig. 5, is a section through the centre of the case, K, showing the arms, L, L, and the spindle, M, M, which are made in one piece of wrought-iron, and very true and in balance, in order to revolve steadily at the high speed at which they revolve. I prefer wrought-iron for the arms, as it gains strength when warmed. The arms are tapered from the spindle to the tips, in order to diminish the centrifugal force which tends to tear them from the spindle. Sideways (see fig. 5) the arms, L, L, are made to fit the case, as near as may be, leaving just sufficient clearance to prevent actual contact arising from vibration, or tremor, or from any slight slackness in the bearings, Q, Q. The case, K, is turned true and smooth inside, and has a loose cover, R, R, bolted on, by means of which the arms and spindle may be put in, or removed for repair. The bearings, Q, Q, run in suitable brasses and pedestals, as well understood by engineers. The friction of the aeriform bodies against the sides of the case, K, diminishes the slip or leakage past the edges of the arms, L, L. The revolving part may be made in

many different ways, and with any number of arms; for instance, the arms may be tubular, or may be fixed between two circular discs revolving with them, or made in any manner which conducts the contents of the case quietly, with a uniform angular velocity, from the circumference to the centre of motion. I have shown, in figs. 4 and 5, one of the simplest constructions for the revolving part, two arms being used, made in one piece, with the spindle. The arms may be made in one piece with a central boss keyed into the spindle. I prefer to make the jet-pipe round, as shown at I, in fig. 5, to avoid choking. Any dust which passes into the case, K, will be wafted round its inner circumference, and finds its way through the round hole, S, into the air-tight chamber, T, whence it may be removed after the day's work, by the air-tight door, shown by the dotted circle, U, which may be made similar to the fire-box and ash-box doors. When the engine is used, as in fig. 4, with products of combustion and crude steam, the power may be regulated by a throttle-valve in the pipe which feeds the ash-box with air. The engine may be started by first warming the contents of the fire-box, by lighting the fire with the fire-box and ash-box doors open, then closing them as well as the valve in the air-pipe, and injecting the first dose of water by hand, the feed-pump being made so as to be readily disconnected for this purpose. When the steam-jet is used, as described further on, the regulating-valve may be in the pipe supplying it. Safety-valves may be applied to the close furnace, as usual in boilers. It is desirable that the door, C, of the fire-box should be capable of being opened to feed the fire, and shut and secured again quickly, the blast being meanwhile shut off from the ash-box, whilst the great speed of the arms, L, L, may cause the momentum to keep up the motion in the interior. The temperature of the aeriform products is regulated by the quantity of water injected at H, and the temperature must not be so great as to injure the rotary engine. I do not claim the working of a vane-wheel in a case by a jet of ordinary steam, but

I claim, first, causing the products of combustion from a close furnace and the steam generated within the close furnace or ordinary steam to issue in one or more jets tangentially into a case, in which they operate upon revolving parts, and make their exit as near as convenient to the centre or axis about which the parts revolve.

I claim, secondly, tapering the arms from the spindle to the extremities.

I claim, thirdly, causing the products of combustion from a close furnace and the steam generated within it to work an impulsive rotary engine by a jet or jets.

I claim, fourthly, clearing the case of the dust by a hole in the circumference.

I claim, fifthly, proportioning the engine and its connexion with the load, so that the centrifugal force of the aeriform contents of the case shall be equal to half the pressure in the close furnace or boiler, or nearly so.

Figs. 6 and 7, represent a peculiar kind of fan, for the purpose of forcing air into the ash-box of the close furnace. It is driven by the engine itself, either by bands passing round pulleys fixed on the spindle, in the usual manner, or by making the spindle continuous with the spindle of the rotary engine, shown in figs. 4 and 5. The arms, A, A, and spindle, B, are similar to those of the rotary engine, figs. 4 and 5, being tapered to the tips, and fitting the case laterally without contact. The air enters round the shaft at *c*, *c*, *c*, *c*, as usual in fans, but it is delivered all round the circumference through the annular port, D, D, D, D, into the annular pipe, E, E, E, E, which it leaves by the branch, F, and passes through a pipe and valve to the ash-box of the close furnace. The case, G, G, G, G, is made in two halves bolted together at the flange-joint, H, H, H, H. This case is turned smooth inside, also the annular port, D, D, D, D, and the joint faces of the flanges, H, H, H, H. The air being delivered by the arms into the annular port with considerable rotary velocity, the pressure obtained in the pipe, E, E, E, E, and in the ash-box is thereby much increased.

The arms, A, A, may be made with a central boss keyed on to the spindle, and I do not confine myself to the use of any particular number or kind of arms; also the arms may be tubular, the air passing through them in the same manner as the water in the arms of a centrifugal pump.

I claim, first, the use of a fan delivering its air all round the circumference to force air into a furnace of which the products of combustion are used to work an engine.

I claim, secondly, giving taper to the arms of fans used to force air into a furnace of which the products of combustion are used to work an engine.

I claim, thirdly, placing the arms of the fan upon the

same spindle as the revolving parts of a rotary engine driven by the products of combustion and by steam generated within the close furnace.

The air may be forced into the ash-box of the close furnace by a steam-jet, V, fig. 4, in which instance this steam passes up through the fire with the air. This steam may be crude steam, generated in a similar furnace to A, fig. 4, or it may be generated in the ordinary manner, in a water space surrounding the close furnace, instead of fire-clay.

I claim forcing air and steam by a steam-jet, into the ash-box of a close furnace, of which the products of combustion work a rotary engine.

Fig. 8, represents a close furnace, similar to fig. 4, the aeriform products from which rush in a current through the annular opening, A, A, and by the pipe, B, draw hot water in the form of spray from the cistern, C, and drive the spray against the curved vanes of the turbine-wheel, D.

The hot water then drops down at E, and circulates back to the cistern, C, by suitable pipes. The engine is regulated by the handle, F, and screw, G, which move the pipe endways through the stuffing-box, H, giving the required contraction round about the conical end, I, of the pipe, B.

Fig. 9, is a section of the turbine-wheel, D.

Fig. 10, represents another method of carrying in the spray, A, being the jet-pipe from the close furnace, and B, a cistern, containing water, which enters at C, C. If fig. 10 be used without water, cold air will be carried to the rotary engine or turbine along the pipe, D, which may be useful to prevent burning the engine when the products of combustion alone are used without steam.

I claim the causing the products of combustion and steam to draw with them in the manners shown, either air or water in the form of spray into a rotary engine or turbine.

Fig. 11, represents a method of using very hot aeriform bodies at a high temperature to produce power. A, is a cylindric chamber, containing hot water, having a stuffing-box, B, B, in which the brass gasometer chamber, C, moves up and down. Water is thrown in at D, by a pump, and the surplus water keeps running over the lips, E, of the pipe, F, thus maintaining the level of the water. The hot

gases generated at the proper time in any suitable manner enter at G, and after giving the up-stroke to the chamber, C, pass away during the down-stroke with the surplus water by the pipe, F, and valve, I; at the instant of closing the exit valve, I, a small quantity of water is thrown upon it by a pump through the pipe, K, and passage, L, thus sealing it, as but little water will pass, however imperfect the valve-face may become. The rod, M, gives motion to a crank, as usual in steam-engines.

I claim the use of hot aeriform bodies to produce power in a gasometer chamber, the water being retained by a stuffing-box, as shown.

I claim sealing the valves of engines driven by hot aeriform bodies by the affusion of water at the time of closing. —In witness, &c.

WILLIAM FRANCIS FERNIHOUGH.

Enrolled April 10, 1851.

Specification of the Patent granted to ALEXANDER DIXON, *of Abercorn Foundry, Paisley, for Improvements in Moulding Iron and other Metals.*—Sealed October 24, 1850.

WITH AN ENGRAVING.

To all to whom these presents shall come, &c., &c.—

Description of the Drawing.

Fig. 1, shows a side elevation of the machine.

Fig. 2, a front elevation.

Fig. 3, shows a section of a pattern for making pipes, but which, as well as the mould-box, will be varied when making other articles, as will be readily understood by the engineer.

Fig. 4, shows a section of the mould-box and core-bar, and on one side the pattern inserted, and on the other the condition of things before entering the pattern.

In making of moulds for pipes, according to my invention, and which is also applicable to the making of moulds for cylinders, fluted columns, square tubes, and other cast-

ings of a similar nature, by varying the patterns and mould-box accordingly.

The core-bar, A, is put into the socket, *a*, in plate or carriage, B, on which the moulding-box, C, rests. I use the moulding-box, either with hinges, *b*, *b*, or without them. The moulding-box, C, is now placed round the core-bar, A; the plate, B, on which the moulding-box, and the core-bar, A, rests, forms the bottom of the moulding-box, C, and having wheels, *c*, *c*, can be removed on rails, *d*, when moulded, to be blackened, dried, and to receive the molten metal. The moulding-box, C, and the core-bar, A, being placed, the plates, *e*, *e*, are now inserted at the bottom of the mould-box, C, having a recess, *f*, *f*, in them opposite to another recess, *g*, *g*, in the core-bar, A, both of which recesses are to receive the displaced sand and to allow the iron pattern, D, to go to the extreme length; the iron pattern, D, is the exact size of the pipe to be moulded, but allowance is made for the shrinkage of the metal, and is to be turned externally and internally in order to ensure a smooth surface; the sharpened point of the iron pattern, D, at *h*, has the bevel equally on each side the iron pattern, D, is fixed to the machine on the chuck, E; the machine is a large vertical slide, with rack and pinion, with wheels, and driven by power. I do not confine myself to the use of this machine, other machinery may be employed for effecting the like object. The pattern, D, being now fixed to the chuck, E, the moulding-box, C, is to be filled with sand to *i*, a mould, *j*, is put over the core-bar at *k*, so that when the moulding-box, *c*, is being filled with sand it allows an equal thickness of sand for displacement by the facet, *l*, of the pattern, D, the mould, *j*, is withdrawn and a plate or ring, *m*, is to be placed on the top of the sand on the core-bar at *n*, which when the pattern is down may be secured in its place with a catch, *o*, before the pattern, D, is withdrawn; the machine is now set in motion and the pattern, D, descends in the moulding-box, C, displacing the sand on either side, coating the internal surface of the moulding-box, C, and the external surface of the core-bar, A, with sand till it reaches the bottom, when the chuck, E, presses the plate, *m*, down on the top of the sand on the top of the core-bar at *n*, until the plate, *m*, is fixed by the catch, *o*, and which plate being now in its position prevents the pattern from tearing away the sand from the

core-bar in its upward motion; the pattern, D, is now to be withdrawn to its former position, the mould and core are now complete, except the forming of the facet-core, *p*, and the bead, *q;* the facet-core is formed in a separate core-box in the usual way, and placed on the top of the sand on the core-bar at *n;* the plates, *e*, are removed, and the plates, *q*, are inserted, and come up against the bevel part of sand at the bottom of the core; these plates, *q*, form the bead; the mould and core are now complete, and ready to be removed to a frame with a winch or any other power, in order to raise the moulding-box with mould from off the core to receive the black wash for dry sand, or the blacking for green sand; when blackened, the box with mould is again put over the core and core-bar, and conveyed to the stove to be dried, if, for dry sand; and when dried, the cake, *r*, *r*, with metal gate, *s*, *s*, and facet-core, *p*, *p*, is now placed upon the top of sand on core-bar at *n*, *n*, and is now ready to receive the molten metal.

I claim the means of making the mould and core of pipes, cylinders, fluted columns, square tubes, and other castings of a similar nature, as herein explained.—In witness, &c.

ALEXANDER DIXON.

Enrolled April 24, 1851.

Specification of the Patent granted to JOHN ROBERT JOHNSON, *of Crawford-street in the County of Middlesex, Chemist, for Improvements in Fixing Colours on Fabrics made of Cotton or other Fibre.*—Sealed October 17, 1850.—(Communication.)

To all to whom these presents shall come, &c., &c.—The improvements consist,—

First, in a mode of isolating or extracting the colouring matter of madder and other rubiaceous plants, such as munjeet, so as to render the colour fit and profitable to be fixed upon fabrics by direct application, instead of by the usual dyeing processes.

In carrying out this improvement, I commence by converting the madder into garancine, as is well understood;

and when the acid employed for the conversion of the madder into garancine has been removed by washing, I treat the residue still remaining upon the filter with a hot aqueous solution, which has the property while hot of dissolving the colouring matter of madder, and of abandoning it while cold; and I continue the addition of such solution until it ceases to take up colouring matter. The liquor when cooled gives up the colouring matter in fine orange flocks, which are collected upon a filter and washed until tasteless and free from acid.

The filtered liquor being now almost entirely free from colouring matter may be used again for a second operation, and so on repeatedly; and to make the process more economical, I pass the cold solution of one operation through a "worm," or other refrigeratory apparatus, immersed in the hot liquor of another operation. This is thereby more rapidly cooled by the transference of its heat to the liquor about to be used, and thus a saving of time, fuel, and plant is effected. Several earthy and saline solutions, with free sulphuric or muriatic acid, have the property of dissolving more or less perfectly the colouring matter of madder while hot, such as a weak solution of chloride of calcium with free muriatic acid. The best solvent is, however, a solution of potash or ammonia alum with free muriatic or sulphuric acid. I usually prepare my solvent thus:—

Alum	. . .	10 pounds.
Sulphuric acid	.	1½ pound.
Water	. . .	12 gallons.

I am aware that the solvent property of a solution of alum upon alizarine, the colouring principle of madder, has been known for many years, and that an acid has been used to precipitate the colour from the aluminous solution. I disclaim the alternate use of solution of alum and acid for the extraction of the colouring matter of the rubiacea, as such a mode of operation is expensive and otherwise impracticable. But I claim as my invention the application of a solution of alum with excess of acid, or of other acidified saline solutions, which, by the simple addition and abstraction of heat, may be rendered again and again fit for use, for the extraction of the colouring matter of madder and other rubiaceous plants. And I claim the abstracting and adding the heat from one solution to the other as already described to the extraction of the colouring matter of the

rubiacea, in order to its being fixed upon fabrics of cotton, silk, &c.

The extract of madder prepared as above may be fixed upon fabrics, by printing it upon cloth prepared with an aluminous mordant, and steaming, as by the process of Fauguet, &c., but I prefer to operate in a different manner.

The second improvement consists in a mode of fixing alizarine, the colouring matter of madder, by whatever mode it be obtained, by mixing it with the mordant, applying them simultaneously upon the fabric, prepared as hereafter described, and steaming to fix them there. Upon cotton unprepared the colour so applied readily yields to soap; but I find that it is rendered perfectly fast and stable by impregnating the cloth with a small quantity of oleaginous matter. The fine hue of the madder is not fully developed until the oil has been oxidized, as in the Turkey-red process. Turkey-red cloth as usually prepared does not, however, answer the purpose, as the alkali and subsequent operations have rendered the cloth coloured. I find the best result to be obtained by the following mixture:—

White soap . .	5 pounds.
Gallipoli oil . .	5 pounds.
Water . . .	10 gallons.

Dissolve the soap, and add the oil to form a mucilage. Pad the cloth in this mixture, dry it, and "age" in a warm room for forty-eight hours; then rinse in water with a small quantity of carbonate of soda,—say one pound of soda to twenty gallons of water,—wash, and dry; simple rinsing through hot soap will partially effect the same object. Old cloth which has been worn and washed many times answers perfectly, showing how minute a quantity of the oleaginous matter is sufficient to give stability to the compound of alizarine and base.

Any salt of alumina when printed with the madder extract gives a more or less perfect colour. I however prefer a mixture thus composed:—

Extract in paste, containing about ten per cent. of dry extract, ten parts by weight.
Pure acetate of alumina, at twenty-five degrees Twaddel, one part.
Gum tragacanth, to thicken.

These proportions may be considerably modified without

greatly modifying the result. But if the alumina be increased beyond a certain point, say when about twenty per cent. of acetate of alumina at twenty-five degrees is employed, the colour ceases to be fixed even upon oleaginous cloth, and it then resembles the common madder lake when printed upon fabrics.

The substitution of a salt of iron modifies the colour from red towards chocolate or black. When the colour is printed, the fabric is hung for a few hours, steamed for half an hour at the lowest pressure possible; then cooled and rinsed through water containing about one-thousandth of its weight of an alkaline carbonate or phosphate. The colour will, however, bear "raising" in weak caustic, alkali, or lime. It is improved by "soaping" after the "raising" and washing.

I claim as my invention the use of oleaginous matter, as above described, for fixing the colouring matter of madder when applied topically, that is, by direct application to the fabric.

The third improvement consists in a new method of operating when the dyeing process is used for fixing the colouring matter of madder. When the ordinary methods of dyeing with madder are used, several "soaping" or "branning" operations are required, in order to clear the "whites" and brighten the colours; and in order that the colours may resist the clearing processes, a large excess of madder has to be used beyond that required for the formation of the colours. To avoid this expense of material, labour, soap, &c., the madder is frequently treated with acids, &c., to convert it into "garancine," and the colours are then obtained bright, and the white clear without the use of soap. Now I find that the same result may be obtained; and as regards the hue of many of the colours, and the stability of all, a superior result may be obtained without converting the madder into garancine, by operating thus:—

First, by simply dyeing with about twenty-five per cent. less madder than is absolutely required when the soaping processes are used.

Second, by padding, by the usual padding machine or "pin roller," a certain quantity of a bleaching liquid unto the dyed piece, and heating the piece over the flue of the padding machine, or over the "tins" of the drying machine, as is already done for the clearing of the whites of garancine.

Almost any of the bleaching preparations, such as chloride of lime, "clearing powder" will answer for this purpose. I however prefer to use a hypochloride of soda, prepared by adding a solution of soda crystals (carbonate of soda) to a solution of chloride of lime, until the lime ceases to be precipitated. If the liquor stand at ten degs. Twaddel, about fifteen per cent. of this liquor and eighty-five per cent. of water will form a solution fit for use in the padding machine.

The pieces may be dyed in the ordinary way (only with the diminished quantity of madder). I however prefer first to treat the madder with water heated from about 120 degs. to 125 degs. Fahrenheit for several hours before being used. The transformation first pointed out by Mr. Higgins then takes place, and the soluble yellow colouring matter passes to the state of red colouring matter (alizarine). I also find that the pectic fermentation takes place at the same time, and that the mass after fermentation contains pectosic or pectic acid. If this fermented madder be used, a saving of time, fuel, and labour results, as the precautions as regards temperature are not necessary; the water containing the residue of the madder may be used for another operation, and the "whites" are clearer.

I claim the application of the process above described to the production of colours and clear whites from madder, without the use of bran, soap, or garancine. I also claim the application of fermented madder to economise time, fuel, and labour in the dyeing process.

The fourth improvement consists in the application of the above-described clearing process to obtain colours and clear whites from spent madder without the necessity of heating the spent madder by steam or otherwise, that is, without converting it into garancine. I find that if the spent madder be washed with dilute acid (I prefer muriatic acid for this purpose), as in the patent granted to Frederick Steiner, June 2, 1832, until the salts of lime be removed, and the washings have become tasteless, it becomes in a fit state to be again used. I then introduce it into the dye vessel with sufficient of an alkaline carbonate to render the dye liquor slightly red, and dye as with garancine. The colour is given up to the mordants, but the whites are bad, and this rendered Steiner's process comparatively without value. The whites are, however, rendered pure by the clearing process above described.

I claim the application of the clearing process aforesaid, for the purpose of obtaining bright colours and clear whites from spent madder, without the necessity of converting the spent madder into garancine.

The fifth improvement in fixing colour consists in a new mode of obtaining a topical colour from alkanet root (*Anchusa tinctoria*).

I digest the root in oil of turpentine, naphtha, or other cheap essential oil, and to the solution containing the colouring matter I add about one-eighth of its volume of a saturated solution of caustic baryta, or a mixture of a salt of baryta or other earth, and caustic ammonia, and I agitate for ten or fifteen minutes. The earthy solution seizes upon the colouring matter and separates it from the essential oil, which is then fit for another operation. The deep indigo blue mass of colour and earth is treated with acetic acid to neutralize the earth, and when printed upon aluminous cloth gives a fine purple. Or the acetic mixture may have a mordant added to it in the usual way of preparing topical colours, and when printed upon the oleaginous cloth before described it gives a fine purple, which resists soaps, alkalies, and acids.

I claim the application of anchusine, the colouring matter of alkanet, as a topical colour, and the process of extracting it as above described.—In witness, &c.

JOHN ROBERT JOHNSON.

Enrolled April 17, 1851.

Specification of the Patent granted to JOHN SCOTT RUSSELL, *of Great George-street, Westminster, Engineer, for Improvements in the Construction of Ships or Vessels Propelled by Paddle-wheels, with a view to better arming the same.*—Sealed October 10, 1850.

To all to whom these presents shall come, &c., &c.—In constructing a ship or vessel propelled by paddle-wheels it is usual for the paddle-boxes to project beyond the sides of the ship or vessel, and fore and aft of each paddle-box there is a platform, which in some cases projects beyond the sides of the ship or vessel, and in other cases the sides of the ship or vessel fore and aft the paddle wheel-boxes

are sponsoned out, in which latter case the projection or platform on either side of a paddle-box may be considered as part of the deck, though projecting beyond the ordinary deck of the vessel, and in the former case it is simply a projecting platform, and sometimes the projections partake of both these constructions. On these platforms it is usually the practice to build deck-houses, which cover more or less thereof, and the bulwark in proceeding from stem to stern follows the contour or form of the side of the ship, and when it comes to such projection or platform it bends out more or less suddenly, and then follows the contour or form of the projection or platform. In other cases, however, the bulwark follows a line which leaves the projection or platform on either side of the paddle-box or part thereof outside of the bulwark. Now, the object of my invention is to take advantage of the space thus offered fore and aft each paddle-box, and to construct and arrange such platforms or projections of ships or vessels propelled by paddle-wheels, so that the guns on these parts may be worked and pointed, and fired more in a line with the keel of a vessel than heretofore. And the best means of carrying out my invention is to cause the bulwarks to follow the line of the sides of the vessel in the ordinary manner, and then to bend out and follow the line of the projections or platforms when such is not already the case. And in those portions of the bulwarks of the vessel where the same bend out to enclose such projections or platforms I contruct suitable ports, and according to the angle that such bending out of the bulwarks makes with the keel, so will be the nearness to a parallelism obtained of the firing of the guns (in those parts of the vessel) with the keel, and I believe that an angle of about forty-five degrees with the keel for such bending out of the bulwarks and platforms or projections at either side of each of the paddle-boxes will in most cases offer a convenient angle, as such an arrangement will admit of the guns in these parts of the vessel pointing fore and aft, and firing as nearly parallel as may be with the keel, but other angles may be resorted to or used according to the construction of a particular vessel, and if desired such platforms or projections (it will be evident) may be constructed so bluff at their ends as to admit of the firing of the guns on either side of a ship or vessel (so constructed) as to in-

tersect their lines of fire at a point not very distant beyond the bow or stern of the vessel.

In carrying out my invention, if it be in altering a ship or vessel already built, then if the deck-houses occupy the platforms or projections on either side of the paddle-boxes, the deck-houses, or so much of them as may be found necessary to obtain room for the guns in their localities, will be removed, and in building new ships or vessels such deck-houses will be omitted when sufficient space cannot be conveniently obtained in addition to deck-houses, and in case such platforms or projections of a ship or vessel already built, have not sufficient strength to carry guns, I strengthen the same by beams from side to side of the ship or vessel, similar to the paddle-beams, and cause them to be supported in like manner to such paddle-beams or otherwise, and when building new ships or vessels, and applying my invention thereto, I in like manner obtain strength to the platforms or projections, or I construct them by sponsoning out the sides of the ships or vessels at such parts as heretofore. In all cases taking care to obtain sufficient strength, and at the same time the surface of each platform is to be even with the deck, so that the slides and carriages of the guns used may readily be moved. And I construct such platforms or projections with ports and fittings, according to the description of guns to be used, as is well understood in constructing other parts of ships or vessels for the use of like guns.

And I would state that although I prefer that the bulwarks should enclose the projections or platforms fore and aft the paddle-boxes, and that ports should be formed in those parts thereof, where such projections or platforms bend off, it is not absolutely necessary that such should be the case, as the bulwarks, if desired near those parts, may be moveable, and be removed when the guns which are worked on such platforms or projections are to be brought into use, but in such cases the projections or platforms will be constructed with suitable fittings for the class of guns intended to be employed.

Having thus described the nature of my invention, and the manner of performing the same, I would have it understood that

What I claim is,

The constructing of those parts of ships or vessels pro-

pelled by paddle-wheels, which consist of the projections or platforms fore and aft of the paddle-wheel-boxes, in such manner that advantage may be taken of these spaces for placing and working guns thereon, and so that they may be pointed and fired more in a line with the keel of a ship or vessel than guns near the middle of such ships or vessels have heretofore been.—In witness, &c.

JOHN SCOTT RUSSELL.

Enrolled April 10, 1851.

Specification of the Patent granted to HENRY BESSEMER, *of Baxter House, Old Saint Pancras-road, in the County of Middlesex, Engineer, for Certain Improvements in Apparatus for acting by Centrifugal Force in the Manufacture of Sugar, and other Improvements in the Treatment of Saccharine Matter by such Apparatus.*—Sealed July 31, 1850.

WITH AN ENGRAVING.

To all to whom these presents shall come, &c., &c.—My improvements in apparatus acting by centrifugal force in the manufacture of sugar, has reference to several stages of that manufacture, commencing,—

Firstly, with the treatment of the saccharine juice of the cane immediately after it has been expressed, and in which state it is found to be mixed to a greater or less extent with small fragments of the cane, and the arrangement of centrifugal filtering apparatus for separating these particles from the juice, forms the first head of my said invention.

Secondly, the cane juice having been filtered by the before-named apparatus, it may be defecated by any of the usual methods now practised, when a certain quantity of coagulated matters will be found suspended in the juice; I therefore again apply a centrifugal filtering apparatus in this stage of the manufacture, in order to separate such coagulated or other solid matters from the saccharine juice.

When the juice has been thus clarified and filtered by the two preceding operations, it is then heated in an open pan in order to evaporate the aqueous parts of the fluid. To facilitate this evaporation, I lift up the juice (by centrifugal

force) in a tube placed in the centre of the boiling vessel, the upper part of such tube being pierced with numerous small holes, in order that the juice raised within it may, by the rotation of the tube, be dispersed in a shower over the entire area of the vessel. This divided state of the juice presents a very large surface for evaporation, which may thus be conducted at a lower temperature and with greater rapidity than it is in those cases where the surface exposed is only equal to the area of the evaporating vessel. This centrifugal evaporator forms the third head of my invention.

Fourthly, my invention consists in apparatus for applying centrifugal force to the filtering of syrups in the refining of sugar, and consists in two modifications of the before-mentioned centrifugal filter for operating upon the saccharine fluid, and separating therefrom the coagulated or other solid matters after the process of "blowing up," and preparatory to passing such syrups through the charcoal filter.

And, lastly, my invention consists in the application of certain improved modifications of centrifugal force apparatus to the manufacture of sugar when separating the crystals from the fluids and other matters with which they are mixed. A portion of these improved modifications are intended to reduce the vibratory motion communicated by such descriptions of machines to the buildings in which they are worked, while others are improvements in the mode of feeding and discharging the matters operated upon in such machines, and also in the methods of applying power for driving such descriptions of machines, and in the construction of the perforated drums used therein.

In order that the manner in which these several operations and the nature of the apparatus for effecting them may be clearly understood, I have hereunto annexed four sheets of drawings, marked respectively A, B, C, and D.

On sheet A, I have represented the apparatus for separating the cellular tissues of the cane from the juice referred to under the first head of my invention.

Fig. 1, is an elevation.

Fig. 2, a vertical section on the line, A, B, of fig. 3.

Fig. 3, a plan.

Fig. 4, a horizontal cross section on the line, C, D, of fig. 1.

Fig. 5, is a side elevation; and,

Fig. 6, a front elevation of a scraper; and,

Specification of the Patent granted to MACGREGOR LAIRD, *of Birkenhead, Gentleman, for Improvements in the Construction of Metallic Ships or Vessels, and in Materials for Coating the Bottoms of Iron Ships or Vessels, and in Steering Ships or Vessels.*—Sealed January 19, 1850.

WITH AN ENGRAVING.

To all to whom these presents shall come, &c., &c.—My invention consists of improvements in constructing ships and other vessels of sheets of corrugated metal, and in applying hollow trough-like sheet metal for frames or parts of frames of ships or vessels constructed of sheet metal.

Secondly, my invention consists of building metal vessels or boats in sections with internal flanches, and also so as with facility to arrange more or less of such sections into a larger or smaller boat, according to the number of sections at any time used.

Thirdly, my invention consists of coating decks of ships or vessels formed or partly formed of metal with asphalte; and,

Fourthly, my invention consists of improvements in the construction of metal vessels or boats to render the same more suitable for carrying oil, grain, or other matters in bulk.

And in order that my invention may be most fully understood and readily carried into effect, I will proceed to describe the means pursued by me.

I would state in respect to the first part of my invention, that it has before been proposed to employ corrugated metal in the construction of ships and other vessels in order to obtain the greater stiffness of metal. In one case the corrugated metal was sheathed externally with flat or plain sheet metal, in order that the sides of the ships or vessels when so using corrugated metal should be flush; and another mode which has heretofore been proposed has been to make boats or such-like vessels by causing the sheets of metal to be bent in concave and convex moulds, in such manner that the act of

pulley, *r*, on the shaft, *d*. The band is crossed in order that the drum and the scraper may both revolve in the same direction; but if the pulley, *p*, is a little smaller than the pulley, *r*, then the scraper will revolve at a different velocity to the drum, *m*, although in the same direction. This differential velocity will cause the face of the scrapers to move slowly over the interior surface of the drum, while each of them are revolving at a rapid rate. In the lower part of the casing, *a*, there is formed a chamber, *s*, in which I place a centrifugal disc pump, the disc, *t*, being keyed to the shaft, *d*. The upper part of the pump chamber is covered with a plate, *u*, which has a central inlet at u^1. The chamber, *s*, has a delivery pipe, *v*, through which the filtered juice is forced to the deficating vessels, which are supposed to be placed several feet above the level of the filtering apparatus.

The action of the machine is as follows:—The driving strap being shifted from the loose drum, *j*, to the tight one, *k*, the whole apparatus will be put in motion. The cane juice is then allowed to flow into the drum by the pipe, *w*, from whence it falls on to the bottom of the drum, and is immediately thrown off against the felted cone by the centrifugal force acquired by its rotation. The liquid parts will thus pass through felt, or other filtering material, and be received in the outer case, while all such particles of solid matter as may have been mixed with the juice will be retained, and form a coating on the interior of the drum, the inclined blades, which are all the while slowly gaining ground by its increased speed, will have the effect of raising the deposit, each blade lifting it within reach of the next, and so on, until it reaches nearly to the top of the drum, where it will accumulate, and, as the accumulated mass increases in bulk, portions of it, in a state approaching dryness, will be projected over the upper edge, and strike against the curved underside of the shield, from which it will fall perpendicularly to the base of the machine, while the liquid, passing through the felt, or other filtering material, will be collected and run into the centrifugal pump, *t*, from whence it will be forced to any required part of the works. The drawings on sheet, A, are to a scale double that of the other sheets appended hereto.

Secondly, the filtration of the deficated cane juice may be carried on with the apparatus herein firstly described, the hot liquor, in that case, from the clarifier being allowed

to run into the machine by the pipe, *w*, and be discharged by the pipe, *v*, into the evaporating vessels, or both this and the preceding operations of filtering may be carried on with either of the forms of apparatus hereinafter described under the fourth head of my invention.

Thirdly, my invention consists in facilitating the evaporation of cane juice or syrups by centrifugal force, whereby the said liquors are elevated and dispersed in a shower, which falls down again into the evaporating pan, in a more concentrated state, from having lost a portion of its watery constituents by evaporation, caused by the increased surface exposed to the action of the atmosphere while falling through it as a shower. The apparatus used for effecting this object is represented on sheet, D, of the drawings hereunto annexed, where

Fig. 7, is an elevation; and

Fig. 8, a vertical section through the centre of the tube.

a, is a copper tube closed at bottom, and terminating in an axis. At the lower part of the tube is an enlarged part, *b*, with four vertical guides to keep the ball, *c*, in its place. Below the seat where the ball rests are four slots in the tube to admit liquid to the interior of the tube, but which is prevented from returning by the ball valve, *c*. The upper end of the tube is joined to a double cone, the outer one, *d*, having numerous small perforations made in it; the inner one, *e*, is placed a small distance apart from the outer one, but are connected to each other at the upper edge, and thus space is left between them. In the centre of the inner cone a small axis, *f*, projects upwards, carrying a grooved pulley, *g*, by which it is put in motion. The bottom end of the axis is made to enter a small socket formed in a piece of brass, and fastened to the centre of the bottom of the evaporating pan, while the upper end of the axis is supported by a small beam or other convenient part of the building, so that the tube may be made to revolve in a vertical position in the centre of the pan. The tube having been entirely immersed in the liquid, the air will be displaced, and the tube will become full of fluid. It is then placed in a vertical position, the band put upon the pulley, *g*, and a rapid motion given to it, when the liquid will be projected in a shower over the surface of the pan, *w*. The upper part of the cone being of larger diameter than the lower one, it will move at a higher velocity, and project the fluid to a greater distance, while those holes around the lower part of the cone

will disperse the shower to a less distance as the cone diminishes, and thus distribute the shower very evenly. If a current of air be made naturally, or by machinery, to sweep across the pans while the shower is falling, the vapors will be carried off, and the evaporation increased. Whenever the apparatus is stopped, the ball, *c*, will sink down on its seat and prevent the return of the fluid; the upper part will, however, empty itself, but not lower down than the lowest row of perforations, so that whenever it is again put in motion, the liquid will rise up the cone, and draw behind it a fresh supply from the pan.

Fourthly, as regards the centrifugal filtering apparatus for separating the coagulated and other matters from syrups in the process of refining sugar, on sheet D, of the annexed drawings, one form of apparatus for this purpose is shewn at figs. 1 and 2, the former being an elevation, and the latter a vertical section; *a*, is the outer case of the machine, having an inclined bottom, so as to prevent the filtered liquor from getting to the axis, the hollow formed at a^1, having a pipe inserted therein for the purpose of allowing the fluid to run off; in the central part of the bottom, a cup, a^2, is formed, and into which is fitted a brass bush, *b*, forming the step in which the lower end of the shaft, *c*, revolves, while its upper end is supported in a bush, *d*, let into the boss, e^1, of the curved arm, *e*, this curved arm is firmly secured by bolts to the upper flange of the outer case. On the shaft, *c*, is fixed the centrifugal drum, *h*, which is composed of a flat disc, h^1, supported by two hollow sheet-iron cones, h^2 and h^3. These cones are rivetted at their small ends to flanged bosses, *f* and *g*, and these bosses are keyed firmly to the shaft, and thus the general stability of the drum is secured. At the upper part of the drum there is an enlargement of its diameter, h^4, which serves two important purposes, and which is hereinafter more particularly referred to. In the lower part of the drum there is placed a series of scrapers, *i*, *i*, fixed on to a bent arm, *j*, which has a tubular axis, j^1, fitting freely over the shaft; *c*, the upper part of this cylindrical piece terminates in a grooved pulley, *k*, by which motion may be transmitted to it from any first mover; on the upper part of the shaft, *c*, there is another grooved pulley, *m*, by which motion is transmitted to the shaft, *c*, and drum, *h*. Now if the pulleys on the axle of the first mover, which gives motion to this machine, are both of equal diameter, and the pulley, *k*, be made somewhat smaller in dia-

meter than the pulley, *m*, then it will follow that the scrapers, *i*, will move faster than the drum when the machine is put in motion, and the syrup or liquor is allowed to flow into the machine through the pipe, *p*; the fluid portions will be driven by centrifugal force through the pervious drum, while the solid or coagulated matters will be retained within the drum, and as the inclined scrapers have a motion somewhat quicker than the drum, their action will be to lift up the sediment from the lower to the upper, or enlarged part of the drum, in the manner already described in reference to sheet A, in the lower part of the drum; the centrifugal force is only sufficient to insure a rapid passing through of the liquor, but as soon as the sediment is received in the enlarged part, h^4, which is also pervious, it is subjected to a very much more powerful centrifugal action, in consequence of the increased rate at which it revolves, whereby these refuse matters are dried sufficiently not to require any after process of pressing, as usually practised when such matters are taken out of filter-bags.

When the apparatus has been in operation some hours, and a large accumulation of these solid refuse matters has taken place in the enlarged part of the drum, the machine may be stopped, and these matters removed by hand, when the process may be continued as before. The drum, both at the large and small part, is to be covered with felted wool, or other suitable filtering material, as before described in reference to the apparatus shewn on sheet A. Although I have described the apparatus, figs. 1 and 2, sheet D, as being used for separating the coagulated matters from syrups in the refining process, it will, nevertheless, be obvious that the same may be advantageously applied to the separation of the fragments of cellular tissue found mixed with cane juice, as it comes from the mill or cane-press.

In some conditions of the syrups or saccharine fluids it is considered disadvantageous to bring them in contact with atmospheric air to any great extent. To avoid any injury from contact with air in the process of filtration, I construct an apparatus, shown on sheet D, where fig. 3 is an elevation, and fig. 4 a vertical section thereof; the upper part of the case, *a*, is separated from the lower compartment by a partition-plate, a^1, dividing the case into two chambers, a^2 and a^3; in the centre of the machine there is a tubular shaft, *b*, which passes upward through the stuffing-box, *c*, formed on the cover, *d*, of the upper chamber. Above

this stuffing-box, the shaft, *b*, has keyed upon it a driving-drum, *e*, and above this the shaft, *b*, has an enlargement, forming a stuffing-box, *f*, with a gland and packing in the usual way; a pipe, *g*, enters this stuffing-box, for the purpose of conveying the liquor to be filtered to the tubular axis, while the latter is revolving; within the chamber, a^2, there is a centrifugal drum, *b*, covered with felt, in the manner hereinbefore directed for filtering. The drum has a conical bottom, inclining downwards to the shaft, in which there are four slots, *i*; in the lower chamber, a^3, there is another stuffing-box, *j*, through which the tubular axis passes and prevents any escape of liquid from the upper on to the lower chambers; below this last-named stuffing-box there is a stop-cock, *n*, with two nozzles, *m*, proceeding from it at right angles to the axis, so that, when this cock is opened, any fluid that is contained in the drum, *b*, will pass through the slots, *i*, and issue from the nozzles, *m*, and fall into the lower part of the chamber, a^3, from whence it will be conveyed by the pipe, *l*. Around the lower chamber are eight holes, *o*, large enough to insert the arm for the purpose of turning the cock, *n*, or for tightening the packing of the stuffing-box, *j*, and for supplying oil from time to time to the cup, *p*, in which the lower end of the shaft, b, revolves. The tubular shaft, *b*, has a partition made in it at b^1, for the purpose of preventing a direct communication through it; immediately above this partition there are numerous holes, *r*, drilled in the tubular axle, and on the outside of this part there is a boss, *s*, having a recess, s^1, formed around the inside of it. This boss is placed between the shoulder, *t*, and a collar, *u*, fastened on the tubular axis; the boss is so fitted as to be free to revolve upon the tubular axis, and it is provided with two projecting tubular arms, *v*, *v*, having holes, v^1, made in the side of them in opposite directions, as is well known in the construction of "Barker's mill," so that when fluid is allowed to descend through the pipe, *g*, and tubular axis, *b*, it passes through the holes, *r*, and is projected from the holes in the arms, *v*, causing them to revolve in an opposite direction to that of the effluent stream. To the ends of the arms, *v*, is attached a light brush or scraper, *x*, for the purpose of preventing a thick deposit of coagulated matters from settling on the drum and diminishing its power of filtration; the drum, *h*, of this machine differs from those before described, in having a close cover, *w*, bolted upon it.

When this apparatus is to be used, the chamber, a^2, and the drum, *h*, are both entirely filled with syrup; the centrifugal drum, *h*, is put in rapid motion by the driving drum, *e*, when the centrifugal force generated thereby will drive a portion of the fluid from the interior of the drum, *h*, through the filtering media contained between the two perforated metal cones, as before described in reference to the apparatus shown on sheet A; the fluid thus forced into the chamber, a^2, can be conveyed to any desired part of the building by a pipe connected with any part of the chamber, a^2, but not shown in the drawings, while a fresh supply of liquid will flow into the drum by the pipe, *g*, and issuing through the orifices, v^1, will cause the arms, *u*, to revolve at a speed differing slightly from that of the drum, *h*, whereby the matters which cannot escape through the filtering material are prevented from adhering to the interior of the drum; after working some time it will be necessary to stop the supply of liquor from flowing through the pipe, *g*, and also stop the revolving drum; the cock, *n*, may then be opened and the impure contents of the drum allowed to flow out, after which the operations may be resumed in the manner before described.

And, lastly, with regard to my improvements in the centrifugal apparatus for curing sugar. Much difficulty has hitherto been found in keeping machines of this kind steady in consequence of the unequally balanced load which they have to carry, and hence a violent oscillatory motion is sometimes generated on them; a great wear and tear of the machines is the result, accompanied by a considerable amount of vibratory motion, which is imparted to the buildings in which they are worked.

Now, the object of the first part of my improvements under this head of my invention is to lessen, or entirely remove these defects; the apparatus with which this is accomplished is represented on sheet B, of the annexed drawings, where

Fig. 1, is an elevation.

Fig. 2, a vertical section; and

Figs. 3, 4, 5, 6, 7, and 8, enlarged views of the peculiar universal ball-joint made use of in the suspension of the drum.

The outer casing, *a*, of the machine is supposed to stand on the floor of a sugar-house, of which the lower flange, a^*, is bolted to the floor. To the beams, *b*, of the floor

above, a conical piece of cast-iron, *c*, is secured by bolts passing up through the beam. In the lower part of *c*, there is a bell-metal bush, *e*, made so that the lower half of the ball, *d*, may rest in it; a conical apperture is made for the shaft, *f*, to pass through the bush; the ball, *d*, is made of steel and is welded on to the shaft, *f*, of which it forms a part. The upper part of the ball has a slot or recess cut into it extending around half its circumference, as seen at d^1, figs. 3 and 4; a piece of steel, *g*, of a curved form is fitted to this slot in such a way as to be able to slide in it freely; the shape of this piece will be best understood by referring to figs. 6, 7, and 8, where it is represented in three different positions; it is in the form of a portion of two rings crossing each other at right angles, but is made of one piece of steel, the inner or smaller circle, *g*, fits into the slot in the ball, *d*, while the portion of the larger circle, g^1, is made to fit the semicircular slot or groove, h^1, cut out of the underside of the cup, *h*, which rests upon the ball, *d*; this cup is shown in plan at fig. 5, and in its proper position in fig. 2, where it will be seen to form the lower end of a short shaft, *i*; the upper end of this shaft works in a suitable brass bush in the conical piece, *c*, and carries a drum, *k*, by means of which motion may be transmitted by a wire rope or other band passing through holes on the piece, *c*. The perforated drum, *m*, in which the sugar is to be operated upon may be constructed as usual, or according to the modes hereinafter described, and fixed upon the shaft, *f*; the lower part of the drum has a shallow conical piece of plate metal, m^1, rivetted to the bottom of it to increase its strength; on the lower end of the shaft, *f*, is placed a roller, *n*, covered with leather or other soft substance; this roller is free to revolve on the shaft, *f*; the foot of the outer case, *a*, has on the inside a circular part, a^1, turned smooth, against which the roller, *n*, may revolve when it happens to come in contact; the ball-joint is lubricated by putting oil into the lower part of the cone, *c*, where it will have free access to the ball; any portion which may run through is received in a cup, *x*, placed on the shaft, *f*, below the ball. The operation of the machine is as follows:—Rotary motion being transmitted to the short shaft, *i*, that motion is transmitted to the shaft, *f*, which is suspended by its ball; thus will the drum and its contents be free to revolve upon the true centre of gravity, and without stress upon the machine. In so doing an undue

amount of oscillation is prevented by the roller, *n*, which limits the distance of the motion.

Fig. 9, shews a nearly similar arrangement of universal joint for suspending the drums of centrifugal machines, the difference being, that a pair of plain friction cones, z, z, or a pair of bevilled wheels, are used in lieu of the cord and pulley, shewn in figs. 1 and 2.

In figs. 1 and 2, it will be seen that the outer case is much diminished in diameter below the centrifugal drum; this is done to allow the men who supply materials to the drum to stand nearer to it, the flanges generally used being much in their way; it also much diminishes the weight of the machine. The liquid thrown off, by centrifugal force, is received in the curved channel, a^2, from which it may be led off by a pipe not shown in the drawings.

In some cases, where the ceiling of the room is very lofty, or where there is only a light roof overhead, it would be very inconvenient to suspend the drum in the manner represented in figs. 1, and 2, sheet B, but as it is desirable that the drum and its contents should revolve on their own centre of gravity, and not be constrained to move on an axis, which does not coincide therewith, I construct the apparatus as represented in figs. 5 and 6, sheet C. Fig. 5 being an elevation, and fig 6, a vertical section; *a*, is the outer cast-iron case; the central part is formed into a hollow cone, a^1; in the upper part of this cone a brass or other suitable bush is fitted, in which the shaft, *b*, revolves its lower end, resting in a gun-metal step, *c*, the upper part of which forms an oil cup. On the shaft, *b*, is a drum, *d*, keyed upon it; the strap to turn it, passes through slots, *e*, *e*, in the outer case. The upper end of the shaft, *b*, is formed into a ball, having a slot cut into it and a cross piece fitting thereto, as already fully described. In reference to figs. 1 and 2, sheet B, the cup part, *f*, is rivetted to the sheet iron cone, *g*, which forms part of the centrifugal drum, g^1, which will be free to deviate sufficiently from the axis, *b*, to find its own centre of gravity on which it will quietly revolve.

In some cases where the drums of centrifugal machines have been very unequally loaded, the great additional force exerted by centrifugal action on the heavy side of the drum, causes the shafts to bend, and not unfrequently breaks the drum. To prevent this, without adding to the weight of the machine, I construct a hollow conical shaft as represented in figs. 7 and 8, sheet C. Fig. 7, being an eleva-

tion, and fig. 8, a vertical section; *a* is a hollow cone of stout sheet iron, and, *b*, another cone of the same material; each of these cones have at their smaller ends a short steel spindle, *r* and *s*, firmly rivetted in them, and the base of each cone has a flange turned up around it, and between these flanges a disc of sheet iron, *c*, is rivetted, uniting the whole together, the cones, *a* and *b*, serving in lieu of the ordinary shaft, and the disc, *c*, forming the bottom of the centrifugal drum: in this way extreme lightness is combined with great strength and rigidity; the outer case, *d*, has two brackets, *e*, projecting from its upper part for the purpose of supporting the curved arm, *f*, in which the upper axis of the drum revolves. Near the top of the cone, *a*, is a grooved pulley, *t*, to which motion is communicated from any first mover, and, *g*, is a ring of iron rivetted to the inside of the cone, which serves to strengthen the cone, and also forms a means of supporting the upper part of the drum by means of light connecting rods, *h*, *h*, which are screwed into the ring, *g*, at one end, and at the other they are rivetted to the upper flange of the drum. To prevent the jarring action so disadvantageous in the machines I make a conical piece of hard leather to fit the shaft, which it embraces, and forms a bush, instead of brass, as commonly practised; this leather bearing is represented at *i*, fig. 8, where *j*, is a gland, which screws down upon it, and forces it into the cone until it is sufficiently tight, the lower end of the shaft also runs upon a flat disc of leather, *k*, which may be renewed when requisite, by unscrewing the plate, *l*, at bottom; the hollow part, *m*, forms an oil-cup, for the supply of oil to the leather, which soon becomes so saturated as to allow the shaft to run for a considerable time without a fresh supply, while the elasticity and softness of the material prevents, to a great extent, the vibration so severely felt in rigid bearings, nor is there that amount of wear upon the shaft, as when metal bearings are used, the shaft only becoming polished by wear, instead of roughened or worn into grooves; the upper bearing of this machine is also of the same description, *n*, being the leather bush, and *m*, the gland to tighten it down, with the upper part of the gland being hollowed out, to form an oil-cup.

The outer case, *d*, of this machine is furnished with a large flange at bottom, d^1, by which it is bolted down to the floor; for this purpose the floor should be hollowed out to receive it, and several thicknesses of felt, vulcanized india-rubber, or other suitable elastic substance, should be placed

below the flange at *v*, the whole being sunk sufficiently deep, so that the upper side of the flange is level with the rest of the floor, and may be walked on without difficulty. By thus embedding the machine on an elastic foundation, much of the vibratory motion usually transmitted to the building will be avoided, while the machine will, in the same ratio, be reduced in wear and tear.

The mode of supplying the semi-fluid matters to the machines now in use for curing sugar, and the way in which such matters are removed from the machine is a subject of much importance in the economy of this process. The mode heretofore used for this purpose is to supply the machine by pouring in the matters from a large vessel while the machine is at rest, or nearly so—and after the matters have been operated upon by centrifugal force, and the fluid portions separated, the machine is again stopped, and the solid crust of sugar formed around the interior of the drum is dug out by a small shovel, and put into any convenient receptacle. This operation takes nearly as much time as the operation of separating the fluid parts, so that the machine is kept idle for a long time, during each day, while the workman in charge of the machine is, in turn, kept idle during the mechanical part of the operation. Now, to obviate this loss of time by the machine, and allow the operations to be performed by the man during the working of the machine, I construct it in such a manner as will allow the removal of the centrifugal drum and its contents away from the machine at once, and its replacement by another drum, already charged with the semi-fluid matters, to be operated on, so that the machine, with its new drum and charge of materials may be set going at once, and while it is being operated upon, the workman can employ his time in removing the sugar from the drum just taken from the machine; and, having done so, he can recharge it prior to the stopping of the machine, when the change of drums will again take place, and the operations proceed in the same order as before, causing as little delay as possible to the machine, and providing full employment for the operator.

This form of apparatus is represented on sheet, B, of the drawings annexed.

Fig. 16, being an elevation;

Fig. 17, a vertical section;

Fig. 18, an elevation of the shaft or axis of the drum; and,

Fig. 19, a vertical section of the drum as seen when removed from the machine. A, is the outer case made small at foot, for the purpose of allowing the workman to stand close to it, while removing the drum, it is secured to the floor by bolts, B, which pass through an iron frame, C, and are then screwed into the foot of the case at A[1]. The frame, C, has a boss in its centre, C[1], in which is a bell metal step, D; the boss being hollowed out, forms an oil cup to lubricate the lower end of the shaft, E, while the upper end of this shaft passes through a brass bush let into the boss, A[2], formed in the foot of the outer case. After passing through this bearing, the shaft is formed into a hollow hemispherical cup, E[1], which is to be lined with leather round the upper part, marked with a star. The shaft, E, has also upon it a bevilled drum or wheel, F, by which it is driven by any first mover. The case, A, has a portion rising up in the centre in the form of a cone, A[3], into which is placed a piece of vulcanized india rubber, leather, or other elastic body shewn at G, in the centre of which is a light brass bush, in which the main shaft, H, revolves. The lower part of this shaft is formed into a half ball, H[2], which fits into the cup, E[1], which has to bear the entire weight of the drum, K, and its contents, so that when the shaft, E, is made to revolve, the shaft, H, will revolve also, because there will be much less friction to be overcome in making the shaft revolve in its upper bearing than would be required to make it slip in the cup, the latter acting as a friction clutch, which will prevent much of the difficulty in stopping and starting these machines: the elastic material, used around the upper bearing, will take off much of the jar produced by oscillation of the drum, and the spherical shape of the foot of the shaft will admit of this motion without interfering with the driving of it. On the upper end of the shaft, H, a conical piece of iron, I, is firmly keyed (see fig. 18); it is turned true and fits accurately the internal cone, J, of the drum. The lower part of the drum is dished out at K[1], so that when it is placed on the floor, and the fluid matter poured therein, it will not reach so high as the perforated cylindrical part, and, therefore, will hold the matters securely until it is required to be placed on the machine. It will be observed that no fastening of the drum on to the machine is required, since the cone, I, will hold it firmly and truly in its place, and, at the same time, admit freely of its removal whenever it is desired. Whenever the machine is put in rapid motion,

the semi-fluid mass, will immediately leave the dish, and arrange itself evenly around the cylindrical part of the drum, and allow its fluid constituents to be driven off. In those establishments where very large quantities of saccharine compounds are required to be operated upon by centrifugal force, for the purpose of separating the fluid from the solid constituents, it may be desirable to still further economise the lost time of the machine, caused by stopping it to remove the drum, and also to dispense with the operation of charging and discharging it of its materials. To effect the object, I construct an apparatus as shown on sheet c, of the annexed drawings, where fig. 1 is an elevation.

(To be continued.)

An Act to extend the Provisions of the Designs Act, 1850, *and to give Protection from Piracy to Persons exhibiting new Inventions in the Exhibition of the Works of Industry of all Nations in One thousand eight hundred and fifty-one.* [*April* 11, 1851.

ANNO DECIMO QUARTO VICTORIÆ REGINÆ.—CAP. VIII.

WHEREAS it is expedient that such protection as hereinafter mentioned should be afforded to persons desirous of exhibiting new inventions in the Exhibition of the Works of Industry of all Nations in one thousand eight hundred and fifty-one: Be it therefore enacted by the Queen's Most Excellent Majesty, by and with the advice and consent of the Lords Spiritual and Temporal, and Commons, in this present Parliament assembled, and by the authority of the same, as follows:—

I. Any new invention for which letters patent might lawfully be granted may at any time during the year one thousand eight hundred and fifty-one, but not afterwards, be publicly exhibited in any place previously certified by the Lords of the Committee of Privy Council for trade and foreign plantations to be a place of exhibition within the meaning of the Designs Act, 1850, without prejudice to the validity of any letters patent to be thereafter, during the term of the provisional registration hereinafter mentioned, granted for such invention to the true and first inventor thereof: Provided always, that such invention have pre-

viously to such public exhibition thereof been provisionally registered in manner hereinafter mentioned; and provided also, that the same be not otherwise publicly exhibited or used by or with the consent of the inventor prior to the granting of any such letters patent as aforesaid, except as hereinafter mentioned: Provided also, that no sale or transfer, or contract for sale or transfer, of the right to or benefit of any invention so provisionally registered, or of the rights acquired under this Act, or to be acquired under any letters patent to be granted for such invention, shall be deemed a use of such invention; and the publication of any account or description of such invention in any catalogue, paper, newspaper, periodical, or otherwise shall not affect the validity of any letters patent to be during such term granted as aforesaid.

II. The public trial or exhibition of any such invention as aforesaid (being an invention for purposes of agriculture or horticulture), which shall be certified by the Lords of the said Committee to have taken place under the direction of the Commissioners for the Exhibition of 1851 for purposes connected with the exhibition thereof, in such place of public exhibition as aforesaid, whether such trial or exhibition take place before or after the passing of this Act, shall not prevent the provisional registration of such invention under this Act, nor prejudice or affect the validity of any letters patent to be granted for such invention during such term as aforesaid.

III. Her Majesty's Attorney-General, or such person or persons as he may from time to time appoint to issue certificates under this Act, on being furnished with a description in writing, signed by or on behalf of the person claiming to be the true and first inventor within this realm of any new invention intended to be exhibited in such place of public exhibition as aforesaid, and on being satisfied that such invention is proper to be so exhibited, and that the description in writing so furnished describes the nature of the said invention so intended to be exhibited, and in what manner the same is to be performed, shall give a certificate in writing, under the hand or hands of such Attorney-General, or the person or persons appointed as aforesaid for the provisional registration of such invention.

IV. The Registrar of Designs acting under the Designs Act, 1850, upon receiving such certificate, and being furnished with the name and place of address of the person

by or on whose behalf the registration is desired, shall register such certificate, name, and place of address, and the invention to which any certificate so registered relates shall be deemed to be provisionally registered, and the registration thereof shall continue in force for the term of one year from the time of the same being so registered, and the Registrar shall certify, under his hand and seal, that such invention has been provisionally registered, and the date of such registration, and the name and place of address of the person by or on whose behalf the registration was effected: Provided always, that if any invention so provisionally registered be not actually exhibited in such place of public exhibition as aforesaid, or if the same invention be in use by others at the time of the said registration, or if the person by or on whose behalf the said registration has been effected be not the first and true inventor thereof, such registration shall be absolutely void.

V. The description in writing of any invention so provisionally registered shall be preserved in such manner and subject to such regulations as the Attorney-General shall direct, and any invention so provisionally registered, and exhibited at such place of public exhibition as aforesaid, shall have the words "provisionally registered" marked thereon or attached thereto, with the date of the said registration.

VI. Such provisional registration as aforesaid shall during the term thereof confer on the inventor of such invention, with respect thereto, all the protection against piracy and other benefits which by the Designs Act, 1850, are conferred upon the proprietors of designs provisionally registered thereunder with respect to such designs; and so long as such provisional registration continues in force, the penalties and provisions of the Designs Act, 1842, for preventing the piracy of designs, shall extend to the acts, matters, and things next hereinafter mentioned, as fully and effectually as if those penalties and provisions had been re-enacted in this Act, and expressly extended to such acts, matters, and things; that is to say, to the making, using, exercising, or vending the invention so provisionally registered, to the practising the same or any part thereof, to the counterfeiting, imitating, or resembling the same, to the making additions thereto or subtraction from the same, without the consent in writing of the person by or

on whose behalf the said invention was so provisionally registered.

VII. All letters patent to be during the term of any such provisional registration granted in respect of any invention so provisionally registered shall, notwithstanding the registration thereof, and notwithstanding the exhibition thereof in such place of public exhibition or otherwise as aforesaid, be of the same validity as if such invention had not been so registered or exhibited; and it shall be lawful for the Lord High Chancellor, if he think fit, on the grant of any letters patent to any inventor in respect of any invention provisionally registered under this Act, to cause such letters patent to be sealed as of the day of such provisional registration, and to bear date the day of such provisional registration, the Act of the eighteenth year of King Henry the Sixth or any other Act notwithstanding.

VIII. Notwithstanding anything contained in the Designs Act, 1850, and the two Acts therein referred to, and called the Designs Act, 1842, and the Designs Act, 1843, the protection intended to be by those Acts extended to the proprietors of new and original designs shall be extended to the proprietors of all new and original designs which shall be provisionally registered and exhibited in such place of public exhibition as aforesaid, notwithstanding that such designs may have been previously published or applied elsewhere than in the United Kingdom of *Great Britain* and *Ireland*; provided that such designs or any article to which the same has been applied have not been publicly sold or exposed for sale previously to such exhibition thereof as aforesaid.

IX. All the provisions of the Designs Act, 1850, and the provisions incorporated therewith, relating or applicable to the designs to be provisionally registered thereunder, or to the proprietors of such designs, except the provision for extending the term of any such provisional registration, shall, so far as the same are not repugnant to or inconsistent with the provisions of this Act, apply to the inventions to be provisionally registered under this Act, and to the inventors thereof; and the said Designs Act and this Act shall be construed together as one Act.

X. This Act may be cited as the Protection of Inventions Act, 1851.

LIST OF IRISH PATENTS.

From March 20, to April 16, 1851.

WILLIAM HODGSON GRATRIX, of Salford, in the county of Lancaster, Engineer, for Certain improvements in the method of producing or manufacturing velvets or other piled fabrics.—Sealed March 20, 1851.

WILLIAM STONES, of Queenhithe, in the city of London, Stationer, for Improvements in the manufacture of safety-paper for bankers' cheques, bills of exchange, and other like purposes.—Sealed March 25, 1851.

JOHN RANSOM SAINT JOHN, of the City and State of New York, in the United States of America, Engineer, for Improvements in the process of and apparatus for manufacturing soap.—Sealed March 28, 1851.—(Communication.)

FREDERICK WATSON, of Moss-lane, Hulme, Manchester, in the county of Lancaster, Gentleman, for Improvements in sails, rigging, and ships' fittings, and machinery and apparatus employed therein.—Sealed March 28, 1851.

HERBERT TAYLOR, of No. 46, Cross-street, Finsbury, in the county of Middlesex, Merchant, for Certain improvements in the manufacture of carbonates and oxides of barytes and strontia, sulphur, or sulphuric acid from the sulphates of barytes and strontia, and for certain improvements in the manufacture of carbonates and oxides of soda and potassa.—Sealed April 2, 1851.—(Communication.)

GEORGE SHEPHERD, of Holborn-bars, in the city of London, Civil Engineer, and CHARLES BUTTON, of the same place, Operative Chemist, for Certain improvements in the means or appliances used in conveying telegraphic intelligence between different places.—Sealed April 16, 1851.

LIST OF SCOTCH PATENTS.

From March 12, 1851, to April 17, 1851.

JOSEPH BALDWIN and GEORGE COLLIER, Mechanics, and JOSEPH CROSSLEY, all of Halifax, for Improvements in the manufacture of carpets and other fabrics.—Sealed March 12, 1851.—(*Six months.*)

George Roberts, of Selkirk, in the kingdom of Scotland, Manufacturer, for An improved manufacture of certain yarns, of linen, wool, silk, cotton, and other fibrous substances.—Sealed March 13, 1851.—(*Six months.*)

Samuel Brisbane, of Manchester, in the county of Lancaster, Pattern Maker, for Certain improvements in looms for weaving. — Sealed March 14, 1851. — (*Four months.*)

George Guthrie, of Appleby, Chamberlain to the Right Hon. the Earl of Stair, and residing at Rephad, by Stranraer, in the county of Wigton, for Improvements in digging, tilling, and working land.—Sealed March 14, 1851.—(*Six months.*)

Richard Archibald Brooman, of Fleet-street, for Improvements in purifying water, and preparing it for engineering, manufacturing, and domestic purposes.— Sealed March 17, 1851.—(*Six months.*)—(Communication.)

Edward Lloyd, of Dee Valley, in the county of Merioneth, North Wales, Engineer, for Certain improvements in steam-engines; which improvements are in part, or in whole, applicable to other motive power.—Sealed March 17, 1851.—(*Four months.*)

William Eccles, of Walton-le-Dale, in the county of Lancaster, Cotton Spinner, for Certain improvements in looms for weaving.—Sealed March 17, 1851.—(*Six months.*)

Herbert Taylor, of Cross-street, Finsbury, in the county of Middlesex, Merchant, for Certain improvements in the manufacture of carbonates and oxides of barytes and strontia, sulphur, or sulphuric acid from the sulphates of barytes and strontia; and for certain improvements in the manufacture of carbonates and oxides of soda and potassa.—Sealed March 19, 1851.—(*Six months.*)

David Davies, of Wigmore-street, Cavendish-square, in the county of Middlesex, Coach Maker, for Certain improvements in the construction of wheel carriages, and in appendages thereto.—Sealed March 24, 1851.—(*Four months.*)

Charles Zavier Thomas, (de Colmar,) Chevalier de la Legion d'honneur of Paris, in France, for an Improved calculating machine, which he calls arithmometer.—Sealed March 25, 1851.—(*Four months.*)

William Milner, of Liverpool, in the county of Lancaster, Patent Safe and Safety-Box Manufacturer, for Certain improvements in safes, boxes, and other depositories

for the protection of papers or other materials from fire.——Sealed March 26, 1851.—(*Six months.*)

John Stephens, of the Albynes, in the parish of Assley Abbotts, in the county of Salop, Gentleman, for Certain improvements in thrashing machinery.—Sealed March 28, 1851.—(*Six months.*)

James Cheetham, Jun., of Chaderton, near Oldham, in the county of Lancaster, Manufacturer, for Certain improvements in the manufacture of bleached, coloured, or partly coloured threads or yarns.—Sealed April 2, 1851.—(*Six months.*)

James Black, of Edinburgh, Machine Maker, for a Machine for folding.—Sealed April 3, 1851.—(*Six months.*)—Partly Communication.

William Boggett, of St. Martin's-lane, in the county of Middlesex, Gentleman, and William Smith, of Margaret-street, in the said county, Engineer, for Improvements in producing and applying heat in lighting, and in engines to be worked by steam, or other elastic fluid, which engines are also applicable to pumps.—Sealed April 3, 1851.—(*Six months.*)

Henry Duncan Preston Cunningham, of Bury, in the county of Hunts, Paymaster in the Royal Navy, for Improvements in reefing sails.—Sealed April 4, 1851.—(*Six months.*)

James Hamilton Browne, of the Reform Club, Pall Mall, in the county of Middlesex, Esquire, for Improvements in the separation and disinfection of focal matters, in the purification of gas, in the preservation of animal matters, and in the apparatus employed therein.—Sealed April 9, 1851.—(*Six months.*)

Thomas Greaves Barlow, of 32, Bucklersbury, in the city of London, Civil and Consulting Gas Engineer, and Samuel Gore, of Park, Old Kent-road, in the county of Surrey, Engineer, for Improvements in the treatment of certain substances used in the production of gas, for giving light and heat, and of some of the products of the said substances, as also in the apparatus employed in the manufacture of such gas, and in discharging and giving motion to gas.—Sealed April 9, 1851.—(*Six months.*)

William Galloway and John Galloway, of Manchester, in the county of Lancaster, Engineer, for Improvements in steam-engines and boilers.—Sealed April 14, 1851.—(*Six months.*)

Samuel Holt, in the county of Chester, Manager, for certain Improvements in the manufacture of textile fabrics. —Sealed April 14, 1851.—(*Six months.*)

John James Greenhough, now residing in Washington, in the United States of America, Esq., for Improvements in obtaining and applying motive power.—Sealed April 14, 1851.—(*Six months.*)—(Communication.)

David Christie, of No. 3, St. John's-place, Broughton, in the borough of Salford, and county of Lancaster, Merchant, for Improvements in machinery or apparatus for preparing, carding, spinning, doubling, twisting, weaving, and knitting cotton, wool, and other fibrous substances; also for sewing and packing.—Sealed April 14, 1851.—(*Four months.*)—(Communication.)

Benjamin Guy Babington, of Hanover-square, in the county of Middlesex, Doctor of Medicine, for Improvements in preventing incrustation in steam and other boilers.—Sealed April 16, 1851.—(*Six months.*)

Henry Bessemer, of Baxter-house, Old St. Pancras-road, in the county of Middlesex, Engineer, for improvements in the manufacture and refining of sugar, and in machinery or apparatus used in producing a vacuum in such manufactures, and which last improvements are applicable for exhausting and forcing fluids.—Sealed April 17, 1851. —(*Six months.*)

Thomas Hill, residing at Langside Cottage, near Glasgow, in the county of Renfrew, Scotland, Esq., for Certain improvements in wrought iron, or malleable iron railway chairs, and in the machinery or apparatus employed for producing the same.—Sealed April 17, 1851.—(*Six months.*) —(Communication.)

LIST OF ENGLISH PATENTS.

From March 31, *to April* 30, 1851.

John Gwynne, of Lansdowne-lodge, Notting-hill, in the county of Middlesex, Merchant, for Improvements in machinery for pumping, forcing, and exhausting of steam, fluids, and gases, and in the adaptation thereof to producing motion to the saturation, separation, and decomposition of

substances.—Sealed March 31, 1851.—(*Six months.*)—(Communication.)

John Peter Booth, of Cork, in the kingdom of Ireland, Feather Purifier, for An improved manufacture of fabric applicable to the construction of muffs, boas, tippets, and other like articles, and also to the ornamenting of articles of dress and furniture, and other similar uses.—Sealed March 31, 1851.—(*Six months.*)

Louis Brunier, of Paris, Civil Engineer, for Improvements in obtaining power by the use of steam or compressed air.—Sealed March 31, 1851.—(*Six months.*)

Joseph Richardson, of Halifax, in the county of York, Dyer, for Improvements in dyeing and cleansing piece-goods.—Sealed March 31, 1851.—(*Six months.*)

Auguste Moite, of Southwark, in the county of Surrey, Manufacturer, for Certain improvements in portmanteaus.—Sealed April 2, 1851.—(*Six months.*)

Thomas Huckvalt, of Choice-hill, in the county of Oxford, for Improvements in treating mangel würzel and in making drinks and other preparations therefrom.—Sealed April 2, 1851.—(*Six months.*)

Richard Archibald Brooman, of the firm of Messrs. J. C. Robertson and Co., of Fleet-street, in the city of London, for Improvements in machinery for the manufacture of rope and cordage.—Sealed April 2, 1851.—(*Six months.*)—(Communication.)

William Barker, of Hulme, near Manchester, in the county of Lancaster, Millwright, in the employ of Joshua Schofield and Sons, Fustian Dyers and Finishers, of Cornbrook, near Manchester aforesaid, for Improvements in machinery for chipping, rasping, and shaving dyewood, and other materials, and in apparatus connected therewith.—Sealed April 7, 1851.—(*Six months.*)

Christopher Cross, of Farnworth, near Bolton, in the county of Lancaster, Cotton Spinner and Manufacturer, for Certain improvements in the manufacture of textile fabrics, and in the manufacture of wearing apparel from textile materials.—Sealed April 8, 1851.—(*Six months.*)

John George Appold, of Finsbury-square, Gentleman, for Improvements in machinery for regulating and ascer-

taining the labour performed by manual or other power.—
—Sealed April 9, 1851.—(*Six months.*)

Charles M'Dowall, of Hyde-street, Bloomsbury, in the county of Middlesex, Chronometer-maker, for Certain improvements in the construction of time-keepers.—Sealed April 10, 1851.—(*Six months.*)

Henry John Betjemann, of Upper Ashby-street, Northampton-square, in the county of Middlesex, for Improvements in connecting parts of bedsteads and other frames, and in machinery employed therein.—Sealed April 15, 1851.—(*Six months.*)

Frederick William East, of the Firm of Thomas East and Son, Bermondsey, Leather-dressers, for Improvements in dressing, embossing, and ornamenting leather.—Sealed April 15, 1851.—(*Six months.*)

William Benson Stones, of Warwick-street, Golden-square, in the county of Middlesex, for Improvements in the use and treatment of peat and its products, and other carbonaceous matters; and also for apparatus applicable to such and other chemical purposes.—Sealed April 15, 1851.—(*Six months.*)

Herman Schroder, of Bristol, Gentleman, for Improvements in manufacturing and refining sugar.—Sealed April 15, 1851.—(*Six months.*)

Antoine Victor Coutant, of Paris, in the Republic of France, Iron Master, for An improved mode of partially hardening iron for various purposes.—Sealed April 15, 1851.—(*Six months.*)

Thomas Greaves Barlow, of 32, Bucklersbury, in the City of London, Civil and Consulting Gas Engineer, and Samuel Gore, of Park-road, Old Kent-road, in the county of Surrey, Engineer, for Improvements in the treatment of certain substances used in the production of gas for giving light and heat, and of some of the products of the said substances; as also in the apparatus employed in the manufacture of such gas, and in discharging and giving motion to gas.—Sealed April 15, 1851.—(*Six months.*)

Charles Hardy, of Low Moor, in the county of York, Engineer, for Certain improvements in the manufacture of scythes.—Sealed April 15, 1851.—(*Six months.*)

Robert Newell, of the city of New York, in the United States of America, Lock-manufacturer, and a citizen of the said United States of America, for certain new and useful improvements in the construction of locks.—Sealed April 15, 1851.—(*Six months.*)

Thomas Keeley, of the town and county of the town of Nottingham, Manufacturer, and William Wilkinson, of the same place, Frame-work-knitter, for Improvements in machinery for manufacturing textile and woven fabrics, and other articles composed of fibrous or filamentous materials; also for Improvements in the said fabrics and articles.—Sealed April 17, 1851.—(*Six months.*)

Frederick Puckridge, of Kingsland-place, in the county of Middlesex, Merchant, for Improvements in the preparation or manufacture of materials or fabrics suitable for ornamenting furniture and other articles.—Sealed April 17, 1851.—(*Six months.*)

William Andrews, of George-street, Westminster, in the county of Middlesex, Mechanic, for Certain improvements in steam-engines, and in boilers, in pumps, in safety-valves, and in wheels and axles.—Sealed April 24, 1851.—(*Six months.*)

William Smith, of Snow-hill, in the city of London, Gas-meter-maker, and Thomas Phillips, of Brighton, in the county of Sussex, Gas-fitter, for Certain improvements in apparatus for heating, ventilating, and cooking by gas.—Sealed April 24, 1851.—(*Six months.*)

Robert Hawkins Nicholls, of Pimlico, in the county of Middlesex, Gentleman, for Improvements in machinery for giving motion to agricultural and other machinery.—Sealed April 24, 1851.—(*Six months.*)

Joseph Clinton Robertson, of the firm of J. C. Robertson and Co., 166, Fleet-street, in the City of London, for Improvements in musical instruments.—Sealed April 24, 1851.—(*Six months.*)—(Communication.)

Jonathan Wragg, of Wednesbury, in the county of Stafford, Coach and Axle-Tree Smith, for Certain improvements in railway and other carriages.—Sealed April 25, 1851.—(*Six months.*)

Robert Milligan, of Harden Mills, near Bingley, in the county of York, Manufacturer, for A new mode of

ornamenting certain cloth fabrics.—Sealed April 25, 1851. —(*Six months.*)

James Nasmyth, of Patricroft, in the county of Lancaster, Engineer, and Herbert Minton, of Stoke-upon-Trent, in the county of Stafford, China Manufacturer, for Certain improvements in machinery or apparatus to be employed in the manufacture of tiles, bricks, and other articles from disintegrated or pulverized clay.—Sealed April 25, 1851.—(*Six months.*)

Daniel Dalton, of Spon-lane, in the parish of West Bromwich, and county of Stafford, Iron-Founder, for Improvements applicable to railroads.—Sealed April 26, 1851. —(*Six months.*)

John Coope Haddan, of 29, Bloomsbury-square, in the county of Middlesex, Civil Engineer, for Improvements in the permanent way of railways in railway and other carriages, and in the manufacture of papier maché to be used in making carriages and other articles.—Sealed April 26, 1851.—(*Six months.*)

James Bagster Lyall, of No. 45, Thurloe-square, Brompton, in the county of Middlesex, Gentleman, for An improved construction of public carriages.—Sealed April 26, 1851.—(*Six months.*)

Benjamin Hyam, of Manchester, in the county of Lancaster, Tailor and Clothier, for Certain Improvements in the method of fastening down trowsers or other articles of wearing apparel.—Sealed April 26, 1851.—(*Six months.*)

Benjamin William Goode, of Birmingham, Richard Boland, of the same place, and James Newman, also of Birmingham, for Improvements in chains, chain pins, swivels, brooches, and other fastenings for wearing apparel. —Sealed April 29, 1851.—(*Six months.*)

Philip Webley, of Birmingham, in the county of Warwick, Manufacturer, for Improvements in the manufacture of boots and shoes, and in rendering the said manufacture waterproof; also in the machinery and materials to be used therein.—Sealed April 30, 1851.—(*Six months.*)

Henry Lund, of the Temple, Esquire, for Improvements in propelling.—Sealed April 30, 1851.—(*Six months.*)

THE

REPERTORY

OF

PATENT INVENTIONS.

No. 6. Vol. XVI. ENLARGED SERIES.—DECEMBER, 1850.

Specification of the Patent granted to Henry Bessemer, *of Baxter-house, Old Saint Pancras-road, in the County of Middlesex, Engineer, for Improvements in the Preparation of Fuel, and in Apparatus for Supplying the same to Furnaces.*—Sealed September 20, 1849.

WITH AN ENGRAVING.

(*Continued from* p. 313.)

And further, instead of applying fire direct to the under side of the retort, as shown in Sheet B, I use highly-heated steam for the purpose of heating and softening coal, to be afterwards pressed into lumps or cylindrical pieces. For this purpose a set of cast-iron pipes arranged in a furnace in the same way as is now commonly used for heating air for hot-blast furnaces, and also for heating steam for various purposes into one end of this series of heating-pipes, the waste steam of the engine is allowed to pass, and the pipes being kept at a red heat the steam will acquire a very high temperature, and in that state is to be supplied to the interior of the retort for the purpose of softening the coal; in this case, the retort, which

may be made in the same manner as that represented in Sheet B, but will not require any fire-place or flue beneath it, but should be enclosed in brickwork or other bad conductor of heat; the pipe which conveys the steam should enter at the hopper, *t*, where the soft coal falls into and finds its escape with the gases through the pipe, *u*, into the hydraulic main, where condensation will take place while the gas passes off to the gasometer.

I am aware that the use of heated steam has been proposed for manufacturing coke and for heating certain mixtures of pitch, tar, coal-dust, &c., I therefore do not claim it for those purposes, but what I consider new and of my invention is, the application of highly-heated steam for the purpose of softening coal, in order that it may be formed into a solid mass by pressure, and without requiring the admixture of any cementing material, or foreign matter therewith.

Lastly, with regard to my improvements in supplying fuel to furnaces by a combination of revolving circular fire-bars or wheels, which conduct the fuel into the furnace and progressively move it therein, and finally eject the clinkers or slag at the opposite end of the fire-chamber.

Numerous plans for feeding furnace fires regularly with small coal, and for consuming their smoke, have been brought forward and used with more or less advantage, but there are still some particulars in which the present plans are deficient; in some of them the fire-place is shut up, so as to render it difficult to light the fire, or to get at it in case of accident; most of them retain the fire-bars too long in contact with the hot fuel, by which they become rapidly destroyed, while in other cases the complexity of the structure renders it liable to frequent derangement, and is also a very expensive apparatus. In order to avoid these disadvantages I construct an apparatus, as represented on Sheet B, of the drawings hereunto annexed, where

Fig. 1, is a front elevation of a steam-boiler furnace to which this apparatus is applied.

Fig. 2, is a longitudinal section on the line, A, B, of fig. 1.

Fig. 3, is a vertical cross section on the line, C, D, of fig. 2.

Fig. 4, is a sectional plan on the line, E, F, of fig. 2; and,

Figs. 5, 6, and 7, enlarged views of one of the wheels That part of the apparatus which answers the purpose of fire-bars, consists of a number of thin flat wheels with a projecting-boss cast on one side of them, the thickness of which regulates their distance apart from each other; in all cases this boss should a little exceed the thickness of the rest of the wheel, so that when any number of them are placed next to each other on a shaft, a sufficient space is left between them to allow another similar set of wheels to pass in between their intermediate spaces, as represented in the drawings, where *a*, is a rectangular cast-iron frame, having a flange, a^1, extending around three of its sides, and in front is carried up higher at a^2, and there forms a sort of dead-plate to the furnace. The front of the frame, *a*, is pancelled, and projects forward as far as the face of the two piers, *b*, *b*; on the sides of the frame, *a*, are cast the bosses, *c*, which are bored through and form the bearings for the shafts, *d*, which carry the "wheel-grate;" these shafts, *d*, have a feather made along them, so as to ensure the revolving of the wheels, *e*, with the shaft when the shaft is put into the frame, *a*, and its wheels placed upon it; the collars, *m* and *n*, are fixed in their places by a cross-pin; the wheels, *e*, which answer the purpose of fire-bars having been fixed, the worm-wheels, *g* and *h*, are keyed on to the shafts, *d*; these wheels are so made that they may all work into worms placed below them on the shaft, *f*, but as their diameters are too great to allow of them all working in the same line, I have keyed on the three wheels, *g*, to their respective shafts in a line, and put the two worm-wheels, *h*, further along their shafts, so as to run clear of the wheels, *g*; it will be observed that these wheels are made with a slight curved bevel, in such a way that they can work on either side of the centre of the worm-shaft, *f*, (see fig. 2); the wheels, *g*, are driven by three worms, *i*, and the wheels, *h*, by two other worms, which are not seen, because the bosses, *h**, of the wheels, *h*, obscure them; the end of the shaft, *f*, which projects from the front of the furnace may be provided with a wheel or drum, according to local circumstances, by which motion may be transmitted from the steam-engine, and the worm-wheels, with their respective shafts and grate-wheels, be made to revolve in a direction indicated by arrows on the wheels, *e*; on the underside of that part of the frame, *a*, which forms the dead plate, there

are a number of pieces, *r*, moving on a joint at *s*, so as to bear freely down upon the wheels, *e**, on the second shaft; these pieces serve to fill up the interstices between the first set, e^1, or feeding wheels, and form a continuation of the dead plate; but the wheels, e^1, rising up through the pieces, *r*, will carry forward any fuel that may fall upon them, and thus the movement of the whole of the wheels being in one direction, the fuel will be carried forward and consumed; at the fire-bridge there is a square iron bar, *p*, extending across the furnace, and having a hole through it for the circulation of water; the clinkers that are carried to the back of the furnace can pass out between this bar and the last set of wheels. In the front part of the furnace I have left an arched opening, *t*, of about the size usually made where ordinary fire-doors are used; and in advance of this, a foot or so, I fix the door-frame, *u*, and fire-door, v, so that the fire may be looked at or supplied with fuel with as much facility as in a common furnace, if required, at any time. Above the door-frame, *t*, there is placed a hopper, w, having a feeding-drum, x, with vanes or ribs extending along it; the axis, *y*, of this drum passes out through the pier, *b*, and there has a bevelled wheel, *x*, keyed on it, by which motion may be transmitted to it in any convenient way, and the supply of small coal to the furnace regulated to facilitate the removal of the frame, *a*, and its wheels from the furnace; two long pieces or slides of iron, B and C, are let into the side walls of the furnace; the piece, B, is made so as to receive the side of the frame, *a*, and its projecting wheels, the back of the piece, is strengthened by ribs, B^1, and along the side nearest the fire there is a small flange, behind which the fire-lump, E, is placed, which protects the portion of the iron work from any injurious effects of the heat. In fig. 1, is shown a plate, G, which covers over the opening into this slide, and allows the worm shaft, *f*, to pass out through it; the iron slide, C, has also ribs, C^1, cast upon it to give it strength, and has a flange along the side nearest the fire, to retain the fire-lump, H, in its place, so that the whole apparatus fitting into these two fixed slides may at any time be taken out of the furnace, and again replaced. I have shown on a larger scale, at fig. 5, a side elevation of one of the wheels, *e*, a section of it at fig. 6, and a side elevation of it at fig. 7. Although I have herein shown as an example the application of the combined wheel-grate

to a steam-boiler furnace, it is obvious that it will be equally applicable to numerous other furnaces used for manufacturing purposes.

Having thus described the nature of my invention, I desire it to be understood that I do not confine myself to the precise details, so long as the peculiar character of either part of my invention be retained.

But what I do claim is,

First, the softening of small coals or coal dust by heat, and then forming it into blocks or masses by pressure. I also claim the arrangement of machinery for heating and compressing small coal or coal dust, represented in Sheet A.

Secondly, I claim the heating small coal or coal dust in retorts or close vessels, so as to soften such coal, and then to form the same by pressure into blocks or forms, whereby I am enabled to drive off and collect gaseous and other products from the coal, and to modify the character of fuel produced therefrom. I also claim the direct application of highly heated steam, in such manner as to soften small coal, as a preparatory process, and then to form the same into blocks or masses by pressure. I also claim the method or arrangement of machinery represented in Sheet B of the annexed drawings, for compressing fuel between plungers herein described and set forth. I also claim, in the preparation of coal heated for the purpose of softening the same, the use of exhausting apparatus for the purpose of facilitating the evolution of gaseous matters therefrom, and for the purpose of rendering the fuel more dense, as herein described; and,

Lastly, I claim the supplying furnaces with fuel by the combined use of a series of circular revolving wheels of fire-bars, and intersecting each other, as explained.—In witness, &c.

HENRY BESSEMER.

Enrolled March 20, 1850.

Specification of the Patent granted to CHRISTOPHER NICKELS, *of York-road, Lambeth, in the County of Surrey, Gentleman, for Improvements in the Manufacture of Woollen and other Fabrics.*—Sealed January 23, 1850.

WITH AN ENGRAVING.

To all to whom these presents shall come, &c., &c.— My invention consists,

First, of improvements in the manufacture of terry or uncut piled fabrics woven with woollen or other yarn.

Secondly, my invention consists of improvements in the manufacture of cut piled fabrics, by causing the tops of the loops of terry or piled woven fabrics to be ground off; and,

Thirdly, my invention consists of improvements in the manufacture of felted fabrics, by causing them to be made with undulating surfaces.

I will now proceed to describe the first part of my invention. Heretofore, in manufacturing terry or uncut piled fabrics, wires have been laid into sheds opened in the warp and woven therein, such wires being of a length suitable for being passed from side to side of the warp, so as to protrude to some length beyond each selvage of the fabric; these wires have been for the most part introduced and withdrawn by hand, and there have been means devised for introducing such wires by the act of the machinery wherein terry fabrics have been woven. Now, according to this part of my invention, such wires may be said to be cut into numerous parts, and each part carried by a stem; so that, in introducing the wire into the open sheds of a warp, in place of its passing from one selvage to the other, the other parts of the wire enter at numerous places across the warp, so as to come under the pile warp, and they uphold the loops formed thereon, till shoots of weft have fastened the same, and rendered the loops secure to the face of the woven fabric. In order that this part of my invention may be readily understood, I would state that in the specification of a former patent, dated at Westminster, the 26th day of June, 1849,* I described means of weaving terry weavings, and cutting the same into piled fabrics; and this part of my invention has considerable resemblance to that invention, so far as

* See Repertory, p. 285, vol. xvi. E. S.

introducing bent wires into the warp at intervals; but when it is desired to make terry or uncut pile according to this part of my invention, the cutters of the former patent will be omitted, and only one row of hooks on the bar will be required, and the form of the wires or hooks will be somewhat different to those described in such former specification, as is shown at

Fig. 1, where part of a longitudinal view of the bar employed is shown full size.

Fig. 2, is a transverse section thereof.

Fig. 3, shows a plan and section of a lead of hooks or wires separately; and,

Fig. 4, shows a section of an ordinary loom, having apparatus applied thereto for carrying out this part of my invention.

In using this arrangement, the wires or hooks enter the warp and the bar shogs endways, so as to take on the wires the warp threads which are to make the terry loops, and the loops being made secure by successive picks of weft; the hooks or bent wires will then shog or move back out of the loops, and come into position to take further warp thereon, and so on as will readily be traced by the cuts of wheels shown. It will be evident that when working with Jacquard or figuring apparatus, only those warps which are selected for the time being will be taken by the hooks or bent wires, and thus will terry weavings be produced in pattern. I have not thought it necessary to show more than a section of a loom, as the same is well understood, and is shown more fully in my said former specification, and the parts shown in the present drawings are arranged for working with the loom shown in my said former specification, the hook, bar, and cutters there shown being removed.

I will now describe the second part of my invention, which consists of improvements in the manufacture of cut piled fabrics from terry or pile woven fabrics. Heretofore cut piled fabrics, which have been made from terry woven fabrics, have for the most part been produced by cutting out the wires woven into the fabrics in the act of weaving such terry fabrics. In other cases, particularly when weaving terry fabrics, that is, fabrics with raised or projecting loops in warp machines, the loops have been cut by suitable cutters or knives in the machine wherein the weaving takes place; but, of late years, various means

have been devised for making terry fabrics without wires, and without any ready means of cutting the terry loops when the fabrics are in the loom or machine wherein the same is produced, and it is desirable to have means of converting such descriptions of fabrics (and in fact terry fabrics produced in any way) into cut piled fabrics without or with very little waste of materials, and I have found that terry fabrics may be converted into cut piled fabrics by grinding off the ends of the loops of which the face of a terry fabric is composed. And for this purpose I prefer to cause it to pass under the operation of a rotating cylinder, or cylinders formed with a rough or file-formed surface or surfaces, or coated with emery, ground glass, or other cutting girt; and I move the terry fabric slowly past the grinding cylinder or cylinders, and I cause the cylinder or cylinders to revolve quickly, so as to grind off the tops of the loops; and in this manner may terry fabrics made of silk, cotton, wool, or other fibre, or mixtures of fibres, be made into cut piled fabrics; and in like manner may the face of a terry-woven fabric, after being cut, and also other pile-woven fabrics, be dressed or equalized on the face. I would remark, that I am aware that plain woven fabrics have before been subjected to the action of similar grinding surfaces for the purpose of removing burrs or knots. I do not, therefore, claim the construction and use of such apparatus generally, and the machinery for such purpose may be varied, this part of my invention being confined to improving pile fabrics made from terry or pile-woven fabrics by grinding off the ends of the loops or pile, to equalize and improve the pile surfaces thereof.

I will now describe the third part of my invention, which consists of causing felted fabrics to be made with undulating surfaces. I have discovered that if a narrow edge of metal or other material be moved to and fro on the surface of a fabric made by felting, that a lasting indented line will be produced, the part of the fabric so acted on becoming more felted than the other parts; and if such lines be produced at small distances apart parallel to each other, the effect obtained to the one surface is that of being very similar to Brussels carpeting; and this part of my invention consists of producing on a fabric (made by felting) an undulating surface by such means; and this may be done by causing the felted fabric to be

placed on a table, so that the fabric may be subjected to the action of a series of narrow edges fixed side by side, and parallel to each other, on a bar at the desired distance apart, such series of edges resting on the fabric, and having a quick to-and-fro motion given thereto on the cloth, by which the same will be marked with indented lines, the spaces of fabric between being elevated so as to appear like the undulations of Brussels carpeting. I do not confine myself to this arrangement of apparatus or machinery for producing this effect, as other arrangements may be employed, so long as a fabric made by felting has its surface made into undulations by parallel indented lines.

Having thus described the nature of my invention, and the manner in which the same is to be performed, I would have it understood that I do not confine myself to the details as herein described, so long as the peculiar character of either part of my invention be retained.

But what I claim is,

First, the mode of weaving terry or uncut piled fabrics, herein described.

Secondly, I claim the mode of manufacturing piled fabrics by grinding off the tops or ends of the loops, or pile of terry or pile-woven fabrics; and,

Thirdly, I claim the manufacture of felted fabrics in such manner as to cause them to be made with undulating surfaces as described.—In witness, &c.

CHRISTOPHER NICKELS.

Enrolled July 23, 1850.

Specification of the Patent granted to ALFRED DALTON, *of West Bromwich, in the county of Stafford, Ironfounder, for Improvements in Reverberatory and other Furnaces.*—Sealed December 15, 1849.

WITH AN ENGRAVING.

To all to whom these presents shall come, &c., &c.—My invention is applicable to furnaces wherein atmospheric air is introduced above the fire-bars at the sides of furnaces. Many furnaces have been made with numerous openings at the sides, in order to admit currents of air

into the fires above the fire-bars, and the material usually employed has been fire-brick or stone, and the openings have been obtained either by setting the bricks apart, or else by having the sides made of lumps of fire-clay, or of stone, with numerous perforations through the same to admit air to the fuel above the fire-bars; but in these cases it has been found that, in consequence of the great heat to which some furnaces are liable, parts of material of which the roofs and sides of the furnaces are composed melt and run down the sides, which, together with the clinkers formed by the fuel, stop up the holes. Now my invention has for its object, amongst other improvements, to obviate this prejudicial effect, by causing the sides to stand back, or in recesses, so that the matters melting at the roof and upper parts of the sides of a furnace, in place of running down the sides and into the holes or openings for the passage of air, such melted matters drop down without coming to those parts of the sides of furnaces, so that the sides stand off from such droppings, and therefore the holes or air-passages therein are not so liable to become filled up; and this is the case, whether the sides of furnaces are made of fire-bricks, fire-lumps, or tiles, or fire-stone, or of iron; but such recessing or setting back of the sides of furnaces is most beneficially applicable when using fire-bricks, or fire-lumps, or tiles, or stone. I prefer, however, to use iron in forming the sides of furnaces, and that the iron should be in the form of perforated plates; but the same may be used as bars or other forms, so that they are suitable for the passage of several streams of air on any side of a furnace, the sides being set or recessed back where the streams of air enter, so that any melted matter running down from the roof or upper parts of the sides of a furnace, the same will drop down into the furnace without running into the holes or air passages so as to fill them up.

Another part of my invention is applicable to puddling, reheating, and other similar furnaces used for heating and melting iron, and consists of forming the sides of iron with suitable means for introducing streams of air into the furnace above the fire-bars; this may be best done by having the sides of iron plates with perforations, but other forms of iron, such as bars with spaces between them to admit of streams of air passing freely to the fuel above the fire-bars may be used, this part of my invention

consisting of the use of iron for the sides of furnaces, when those sides are so formed as to admit streams of air to the fuel above the fire-bars.

Description of the Drawings.

Fig. 1, shows a section of the fire-place of a puddling or other like furnace, having the sides thereof of iron perforated with holes for the passage of air to the fuel above the fire-bars. The sides are shown as being set back or recessed, so that any melted matters running down from the roof and from the upper parts of the sides will not run on the sides where the streams of air enter, but will drop as soon as they come to the part, *a, a,* but it is not essential when using iron that the sides of a furnace (where the streams of air come through) should be recessed or stand back.

Fig. 2, shows a longitudinal section across the line, A, B.
Fig. 3, a longitudinal section across the line, C, D.
Fig. 3*, a longitudinal section across the line, E, F.
Fig. 4, a transverse section across the line, G, H.
Fig. 4*, a transverse section across the line, I, J; and,
Fig. 5, a plan in section of a puddling furnace, where perforated plates of iron are used for letting in streams of air at the sides of a furnace above the fire-bars, and the perforations are such as I prefer; but the same may be varied, and other forms of plates with perforations may be used, and even bars of iron with spaces between them may be employed.

Having thus described the nature of my invention, and the means of performing the same, I would have it understood that what I claim is,

First, the mode of constructing the fire-places of furnaces when streams of air are admitted at the sides or any of them, by recessing, or setting back the parts of the sides through which the streams of air pass.

Secondly, I claim the forming of the parts of sides of the fire-places of puddling and similar furnaces used for heating and melting iron, of perforated plates of iron, and of iron in the form of bars; and,

Thirdly, I claim the combining the arrangement of flues shown, with the use of iron sides of such fire-places, whether perforated or in the form of bars.—In witness, &c.

ALFRED DALTON.

Enrolled June 15, 1850.

Specification of the Patent granted to William Buckwell, *of the Artificial Granite Works, Battersea, in the County of Surrey, Civil Engineer, and* George Fisher, *of Taff Vale Railway, Cardiff, Civil Engineer, for Improvements in the Construction and Means of applying Carriage and certain other Springs.*—Sealed April 18, 1850.

To all to whom these presents shall come, &c., &c.—First, our invention consists of improvements in the construction of springs, by which the tensile strength or application of metal is brought into action in giving elasticity or pliability, and the application of such springs to act against the force or load in the direction of their tensile strength.

Secondly, our invention consists of improvements in the application of carriage and certain other springs to act in buffing and traction in the same, and one centre line of the load or force on the springs in the tensile direction of their strength.

In order that our invention may be most fully understood, and readily carried into effect, we will proceed to describe the means pursued by us in carrying out the first part of our invention. In doing so, we will first remark, that springs termed bearing springs, or those used to act against the effect of impact or pressure on, or of a load or force, and other springs, have heretofore been constructed and applied as a segmental, curved, or other pliable beam, the elasticity or action causing a diminishing of the curve, or increase of the chord of the curve, at right angles, more or less to the direction of the load or force; the springs being applied to act against the load or force, more or less at right angles to the chord of the curved or segmental pliable beam, other springs being straight; pliable beams being applied to act in the same direction, the strain of action being transverse. These springs have generally been constructed of a weight of fifty pounds and upwards to every ton of load acting on each spring, and when constructed of plates, the plates diminishing in length or substance, one or both to the apex of the curve being secured or fastened at that part, the diminishing plates being next the substance to which the pliable beam spring is secured; and like springs have also been used in

couples by their ends being bolted together, and the load suspended from the ends or thin part of the springs.

We construct springs to receive or act against the load or force, so that the elasticity or action causes an increase of the curve, and a diminishing of the chord or diameter at right angles to the direction of the load. These springs being applied to act against the load or force in the direction of the load or force on the tensile strength of the spring, freeing the strain from tension and admitting of a lateral movement without prejudice. We construct these springs of about one-tenth the weight of the springs alluded to as being heretofore used as a pliable beam, and in practice we find that our springs will bear in hundred weights, the square of their weights in pounds; but we recommend the load to be only one-half of this. Thus a spring of ten pounds weight will bear the square of ten or 100 hundred weights, but the load should only be two and a half tons. Four springs of ten pounds each being ample for railway waggons having ten tons nett load, while for a load of this weight heretofore springs weighing about 400 pounds have been generally used. This rule for weight of our improved spring is applicable to those we make of an ellipsis or oval form, having the ends increased in thickness gradually from the sides, or formed of an increased thickness by plates, each additional inner plate diminishing in length, the application being to receive the load or force in extending the ends and collapsing the sides of the endless band, the force or load being attached to the thickened ends, or sides, or thickened part of the spring. We have springs of this description weighing ten pounds each in use, and of about the following dimensions: we can safely place sixteen tons on a set of four springs without prejudice to their elasticity, and they are perfectly elastic with the empty carriages. The oval or ellipsis is made of steel, about two inches wide, and three-sixteenths of an inch thick, the plates being of the same substance. The conjugate axis of the spring is eighteen inches, and the transverse axis eleven inches.

In making this spring without plates, we prefer the steel forged or rolled, to give the increased thickness at the ends to about the same weight of metal, or rather less than when constructing it with plates.

We vary the form and application of the spring ac-

cording to the amount of elastic movement and strength required from an ellipsis, in which the force acts on the ends, to a circle, or from a circle to an ellipsis, in which the force may be caused to act on the sides, it being obvious that in this case the sides will be thickened or of a greater substance than the ends, and the weight of the spring will require to be nearly doubled for the same load or force, as would be elastically acted against by the spring receiving the load at the thickened ends of the ellipsis, varying as the amount of departure from one to the other; the application and construction being further illustrated by reference to the drawings hereto annexed, and the letters and figures marked thereon.

We will now describe the second part of our invention, first remarking that heretofore the traction or drawing of a train of waggons or carriages has been effected by a central tension against or under the load, and the shunting or thrusting of such a train has been effected by resistances or buffers at the sides, or *vice versâ*, so that in going round a curve, in drawing, in the first case, the tension has been centrally on or under the load, and while thrusting or shunting is principally and sometimes wholly on the *intrados*, or inner curved side of the load, tending to force the load into a straight line, and *vice versâ*.

We prefer to apply to the drawing and shunting springs to act on the same and one centre line of the load or force making the drawing and buffing one and the same connexion; the two central buffer-rods being connected by an intermediate draw-bar, having slots therein to allow the buffer-rods to recede home to shoulder against a spring. The buffers of two waggons being connected together in traction, the buffer next the acting force is drawn or pulled against the spring of the opposite buffer, the two springs giving elasticity to both buffing and traction, as will be further illustrated by reference to the drawings hereunto annexed, and the letters and figures marked thereon.

Having thus described the nature of our invention, and the manner in which the same is to be performed, we would have it understood we do not confine ourselves to the details, so long as the principle or peculiar character of our invention or any part thereof be retained.

But what we claim is,

The construction and application of springs herein described.—In witness, &c.

WILLIAM BUCKWELL.
GEORGE FISHER.

Enrolled October 18, 1850.

Specification of the Patent granted to WILLIAM MACALPINE, *of Spring Vale, Hammersmith, in the County of Middlesex, General Dresser, and* THOMAS MCALPIN, *of the same place, Manager, for Improvements in Machinery for Washing Cotton, Linen, and other Fabrics.*—Sealed April 23, 1850.

WITH AN ENGRAVING.

To all to whom these presents shall come, &c., &c.—

Description of the Drawings.

Fig. 1, shows an elevation of a machine combined according to our invention.

Fig. 2, shows an end view; and,

Fig. 3, is a transverse section thereof. *a, a*, is the framing, the nature of which will readily be understood on examining the drawings. *b*, is the wash vessel, which we prefer to be formed to receive a perforated false bottom and sides for the purpose of admitting the steam more freely to act on and heat the contents of the vessel. This vessel is supported on an axis, *c*, which turns in a suitable bearing; *d*, is a bevelled cog-wheel fixed at the bottom of the vessel, *b*, and by which a regular rotation is communicated to the vessel, *b*, by means of a steam-engine or other power giving motion to the main or driving-axis, *e*, which by means of a strap, *f*, gives motion to the axis, *g*, on which is fixed the pinion, *b*, which takes into and drives the cog-wheel, *d*. The vessel, *b*, is further supported by the hollow axis, *h*, which is fixed to the axis, *c*, the hollow axis, *h*, having its bearing or support at h^1, as shown. *i*, is a steam-pipe, by which steam is admitted to the axis, *h*, and from it through suitable open-

ings into the space in the jacket and hollow bottom (formed by the perforated false bottom and sides) of the vessel, *b*. The pipe, *i*, and hollow axis are connected by means of a stuffing-box allowing the hollow axis to turn. *j*, is a trough, into which the wash water is run off from the vessel, *b*, in order to empty the same. On the axis are fixed the series of lifters, *k*, *k*, which lift the beaters, *l*, *l*, which slide between guides, *m*, *m*. And it should be stated that lower ends of the beaters are not all of the same size, but the two inner ones about one-half the size of the outer ones, and the intermediate ones are larger and larger up to the outer ones, the object being to render the beating in some degree uniform, notwithstanding the circumstance that the parts of fabrics under the beaters of the outer circumference move faster than the parts of the fabric near the centre. The beater may be supported and put out of action by means of stops, *u*, *u*, which have a tendency (when the handle, *x*, is moved) to come in under the notches, *o*, *o*. The reverse movement of the handle on the axis, x^1, moving all the stops, *u*, out of the way of the notches, *o*; and the beaters may be lifted further by means of the lever, *p*, which are connected together, so as to be acted on simultaneously by means of the rod, *q*. And when that rod is drawn towards the right-hand side of the machine the short ends of the levers, *p*, will be drawn under the rollers of the bar carrying the stops, *o*. Thus (supposing the stops, *u*, to be resting under the notches at the upper ends of the beaters) the beaters will be lifted out of the way of the lifters, *k*. l^1, are stops to prevent the beater falling in close contact with the false bottom, the object of which is to prevent injury to fine fabrics, should only a few folds of such be lying for the time being under the beaters. The stops, l^1, are received on to pieces of india rubber or other elastic substance.

Having thus described the nature of our invention, and the manner in which the same is to be performed, we would have it understood that we do not confine ourselves to the details as herein described, so long as the peculiar character of the invention as herein described be retained.

But what we claim is,

The mode herein described of combining wash vessel

and beaters for the purpose of washing cotton, linen, and other fabrics.—In witness, &c.

William Macalpine.
Thomas McAlpin.

Enrolled October 23, 1850.

Specification of the Patent granted to Rees Reece, *of London, Chemist, for Improvements in Treating Peat, and in Obtaining Products therefrom.*—Sealed January 23, 1849.

To all to whom these presents shall come, &c., &c.—My invention consists,

First, of causing peat to be burned in a furnace by the aid of blast in such manner that inflammable gases, tar, and other products may be evolved and collected therefrom; and,

Secondly, my invention consists of obtaining products of peat, which I call paraffine and liquid paraffine, by operating on the tar or pitchy matter resulting from peat. And in order that my invention may be most fully understood and readily carried into effect, I will proceed to describe the means pursued by me.

Description of the Drawing.

Fig. 1, is a plan; and,

Fig. 2, is an elevation in section of a blast-furnace and apparatus, such as I use in carrying out the first part of my invention. *a*, is a blast-furnace, which I prefer to be lined with cast-iron at the upper part. *b*, is a grating, or fire-bars. *c*, is a blast-pipe, by which a blast of air is forced in below the grating, *b*. I employ a blast of about two to two and a-half pounds on the inch. The upper part of the furnace is covered, the cover being raised when charging the furnace, which is done at intervals, taking care that the charge does not descend so low as to go out. I prefer to employ two blast-furnaces side by side, as shown at fig. 1. *d*, is a pipe leading from the upper part of the furnace and dipping into a close trough, *e*, so that the end of the pipe is closed with water. *f*, is a pipe rising from the trough, *e*, which pipe is the commencement of a series, which constitute the condenser, such

series of pipes being kept immersed in a trough of water, and the gases go off at the end of this series of pipes, and may be collected for use for fuel, or otherwise, as is well understood. The tarry and other liquid products pass away by the pipe, *g*, and are received in any suitable receivers. The tarry products may be treated according to the second part of my invention as hereinafter described, and the other products may be made available for evolving ammonia, wood spirit, and other matters by any of the existing processes applicable to the same. Either hot or cold blast may be used; I, however, prefer to employ hot blast when the peat contains much moisture.

I would remark that I do not confine myself to the construction above shown of the blast-furnace and condensing apparatus, as the same may be varied; and the blast furnace and condensing apparatus separately are not claimed by me as my invention, the first part of my invention consisting of causing peat to be burned by the aid of blast in a furnace so as to evolve and collect inflammable gases and tarry and other products from peat. And I would observe in respect to this part of my invention, that by so treating peat the products thereof will be more beneficially obtained than by distilling peat in retorts externally heated.

I will now describe the second part of my invention, which relates to obtaining a product of peat, which I call paraffine. For this purpose I take tar obtained from peat in the manner above described, or tar which has been obtained from peat by distillation; and such tar being freed from water, I place the tar in a suitable still, and cause the same to be heated, and I distil off about half the quantity at as low a temperature as it will come over, and then I distil over the remainder into a second receiver. The product received in the second receiver will be found to consist of the products I call paraffine and paraffine liquid, and a small quantity of volatile hydro-carbons. The paraffine will be found in crystals, which I separate from the liquid paraffine by hair or other fine sieves, and then melt the crystals, and run the same into moulds about two inches deep, and the cakes thus obtained I subject to pressure in the manner of pressing stearine, by which I separate the more fluid portions. The hard product obtained will be found to be of a dark yellow colour, to remove which colour I

cause the paraffine to be distilled, and the product received into moulds, and the cakes thus obtained are to be subjected to pressure in hot stearine presses, but I have found it desirable to keep down the heat to 100 degrees of Fahrenheit. If not sufficiently freed from colour by the first distillation, that process may be repeated, and after distillation I cause the paraffine to be melted and washed with water and free steam, and I allow the product to stand some days subject to the atmosphere. This product of peat is suitable for making candles. The liquid paraffine I also distil one or more times to remove the colour, and this product may be burned in lamps.

Having thus described the nature of my said invention, and the manner of performing the same, I would have it understood

That what I claim is,

First, the causing peat to be burned in a furnace subjected to a blast, and so as to obtain inflammable gases and other products; and,

Secondly, I claim the obtaining products of peat, which I call paraffine and liquid paraffine, by operating on tar or pitchy matter produced from peat, as herein explained.—In witness, &c.

REES REECE.

Enrolled July 23, 1849.

Specification of the Patent granted to WILLIAM HENRY RITCHIE, *of Brixton, in the County of Surrey, Gentleman, for Improvements in the Manufacture of Copper, Brass, and other Tubes or Pipes.*—Sealed April 23, 1850.—(Communication.)

WITH AN ENGRAVING.

To all to whom these presents shall come, &c., &c.—The invention consists of causing cast-tubes of copper, brass, and other suitable metal to be elongated by causing them to be pressed or rolled between surfaces which alternate, and take the tubes further and further into the grooves at the successive alternations, such grooves being tapering (having their sides inclining towards each other); and the rolling or pressing surfaces are so worked that the end of a cast tube is progressively taken by the nar-

rowest portion of the grooves, which for the time being are to act thereon; the grooves widening out as the parts thereof come into action on the larger and more and more distant parts of the cast-tube. And in order that the invention may be more fully understood and readily carried into effect, I will proceed to describe the drawing hereunto annexed:—

Fig. 1, shows a section of two rollers, which are geared together so as to move at the same surface speed, as is well understood; and they are to be driven in such manner that they are alternately to move first in one direction (that is, in the way of the arrows), so as to take in a cast-tube (with a mandril within it), and roll it between the grooved surfaces, and then the motion of the rollers is to be reversed and bring back the cast-tube, the return motion of the rollers being caused to be somewhat longer in extent than the previous advancing motion, according to the extent the particular class of tube under operation is capable of being elongated at each time of rolling, and which is well known. The rollers will then be caused to rotate and again take in and roll the increased length of tube, and thus again extend its length, the return movement of the rollers again being caused to be somewhat more than the advancing motion, so that when the end of the cast-tube is moved up towards the rollers it will enter a somewhat narrower portion of the grooves, and the rollers will then again rotate and draw in the whole length of tube and again elongate it; the rollers will then again make a retrograde motion and move back the tube, and they are to be caused to rotate back somewhat more than they previously advanced; and then again the end of the tube being forced up to the rollers, they in their advance movement will take hold of the end of the tube further into and at a narrower part of the grooves, a distance equal to that which they moved back beyond what they moved forward; and by these reciprocations, aided by the circumstance of the back rotations being each time greater than the previous advancing motion, the tube will be progressively elongated.

The tube thus acted upon by the grooves will ultimately assume a conical form, corresponding with the portions of the grooves in the rollers which have been called into action; and if the process be continued further, the smaller end of the tube will progressively become cylin-

drical till the whole length of tube is made cylindrical, and of a diameter corresponding with the smallest diameter of the grooves, for it will be evident that the smaller end of the cast-tube having been brought to the diameter of the smallest parts of the grooves, the roller will no longer act thereon, and the end of the tube will progressively be caused to protrude beyond the smaller parts of the grooves; and the smaller parts of the grooves will successively take hold of the tube further and further along its length, and reduce each part of the same to a diameter corresponding with the smallest diameter of the grooves.

It should be stated that after each backward movement of the pressing rollers, the tube is to be slightly turned so that there shall be a constant change where the principal pressure of the rollers takes place. And it should also be stated that the tubes thus in the progress of being elongated should, from time to time, be removed from the mandrils, and be annealed, as is well understood.

I would remark, that the rollers thus used may each have one or more than one groove therein, and more than one tube may be under operation at the same time, or the grooves may be of different sizes, so that a tube having been operated on, and elongated by one of the grooves in each roller, may then be operated on by the next smaller grooves, and so on, and may then be made with parallel sides, as above explained.

And the most convenient mode of carrying the tubes under operation, is to employ a horizontal open quadrangular frame, supported and guided on suitable rails, and caused to slide to and fro; the mandrils being supported thereon at either end in such manner that they will be in the centre of the openings between the rollers, such frame being moved forward when the rollers move forward, and back when the rollers move backward. The tube or tubes under process are to be turned partly round when they are brought back. The frame is to be moved towards the rollers each time immediately after the rollers have made their retrograde movements, and the tubes have been turned partly round, so that the end of the tube or tubes under process may enter the grooves and be taken thereby, when the rollers again make their advanced rotation.

The cast-tubes or pipes to be elongated by these means should by preference be cast conical, though this is not

essential. By these means not only is a new mode of making cylindrical tubes or pipes obtained, but new forms of pipes may be made. Thus, in fig. 2, a pipe or tube is shown tapering from the middle towards each end; and in fig. 3, an enlargement is produced in the middle, the other parts being of the same size, one with the other and cylindrical. Again, in fig. 4, an enlargement is left at one end.

These new forms of pipes or tubes result from the circumstance of being able by the process above described, to act first at one end and then on the other; and also having the power to leave any part of the pipe or tube of an enlarged size compared with the other parts.

Having thus described the nature of the invention and the manner in which the same is to be performed, I would have it understood, that

What I claim is,

The mode herein described of elongating cast-copper, brass, and other suitable metal tubes or pipes, by rolling surfaces caused to alternate in their rotations, and to act as above explained.

And I also claim the making of pipes or tubes without seams of the forms described in respect to figs. 2, 3, and 4.—In witness, &c.

WILLIAM HENRY RITCHIE.

Enrolled October 23, 1850.

Specification of the Patent granted to ALFRED GEORGE ANDERSON, *of Great Suffolk-street, Southwark, in the County of Surrey, Soap Manufacturer, for Improvements in the Treatment of a Substance produced in Soap Making, and its Application to Useful Purposes.* Sealed April 20, 1850.

To all to whom these presents shall come, &c., &c.—In preparing alkaline ley for soap-making there is produced a substance called, and well known as soaper's waste ashes, or soaper's waste, consisting principally of carbonate of lime, but containing generally a small quantity of alkali, and a considerable portion of quick-lime, the latter arising from the excess of lime used by the soap-maker in preparing his ley. This soaper's waste ashes or soaper's waste has hitherto been not only useless

to the soap-maker, but in many cases a source of expense to him by his having to pay for its removal.

Now my invention consists in the preparation from this substance of neutral carbonate of lime, applicable to most purposes for which carbonate of lime is used, and particularly to the manufacture of the substance called "whiting" or "whitening" in commerce. My mode of operating is to introduce a suitable quantity of soaper's waste ashes or soaper's waste into a proper cistern with water till the cistern is nearly full; I then stir up the contents of the cistern till the fine portion of the soaper's waste used is well suspended in the water, when, after suffering it to stand a few minutes till the grosser particles have subsided, the milky liquor is run off into another cistern, where it settles. Now this sediment consists principally of carbonate of lime, but it contains a good deal of quick-lime and also a little alkali, which I remove by washing it repeatedly with cold water until the water comes off tasteless; after which the pure carbonate of lime remaining may be collected and dried in the mode practised by manufacturers of whiting or whitening in the old way, and it then forms very pure whiting or whitening of commerce. This washing out of the quick-lime requires, however, a large quantity of water, and it is therefore a very troublesome operation on this account. I prefer to add to the deposit obtained in the mode described, a clear solution of carbonated alkali in water, in quantity more than sufficient to at once convert the whole of the quick-lime contained in the deposit into carbonate of lime, after which the excess of alkaline solution is easily removed by washing; and the whole mass is now carbonate of lime, applicable to most purposes for which carbonate of lime is used, and especially to the manufacture of whiting or whitening of commerce, as already described. As the washings, when this latter process is followed, contain alkali and carbonated alkali in solution, they may be used instead of water in the preparation of fresh ley, as is well understood by soap-makers, or applied to any other purpose for which an alkaline solution of such a nature may be required.

Now, I claim the application of soaper's waste ashes or soaper's waste to the manufacture of pure carbonate of lime, and of the substance called in commerce "whiting" or "whitening."

And also I claim the application of soaper's waste

ashes or soaper's waste to the manufacture of pure carbonate of lime, and the substance called in commerce "whiting" or "whitening," in the manner described; but I do not confine myself to the exact mode of manipulating I have detailed, so long as the general character of my invention is retained, which is to make from soaper's waste ashes or soaper's waste neutral carbonate of lime, and the "whiting" or "whitening" of commerce. —In witness, &c.

ALFRED GEORGE ANDERSON.

Enrolled September 20, 1850.

Specification of the Patent granted to GUSTAVE EUGENE MICHEL GERARD, *of Paris, in the Republic of France, for Improvements in Dissolving Caoutchouc, (India Rubber,) and Gutta Percha.*—Sealed May 7, 1850.

To all to whom these presents shall come, &c., &c.—The invention consists in certain means of dissolving india-rubber. Heretofore all solutions of india-rubber, whether clear or thick, have all preserved a great coherence and elasticity; the solvent, whatever it may have been, has always expanded very largely the gum, and it is not until after this has taken place with the gum that the real act of dissolving the gum commences: for this reason a large quantity of the solvent is required. To endeavour to remedy these inconveniences and to have the solution of a thick substance, the india-rubber has been heretofore expanded in the solvent and pressed afterwards by means of cylinders; the solution obtained by this process preserves a very great cohesion and elasticity. By the process to be afterwards described I obtain caoutchouc or gutta percha, or the two combined in a state of solution as thick and concentrated as may be required; and further, however thick it may be, yet it loses its tenacity and elasticity, and will assume the form of paste after the evaporation of the solvent, and retake all its former properties. My process consists in mixing with the solvent, of whatever nature it may be, a certain quantity of alcohol, and afterwards to macerate the caoutchouc or gutta percha; they will expand a very little, and at the end of twenty-hours it will become in

the state of paste, and may be moulded into any required form. I prefer to employ as a solvent sulphuret of carbon and chloroform, sulphuric ether, naphtha, essential oils of coal, or turpentine, and to which I add from five to fifty per cent. of alcohol. I then mix the caoutchouc in all proportions, from equal parts up to thirty parts of the alcoholized solvents to one part of the caoutchouc, according to the thickness of the solution required; after one or two days I submit the paste to the process of masticating, according to the ordinary plan, if I would have an equal solution, and in case when it is made with small quantities of the solvents. In the contrary case the heating becomes altogether useless. I adopt the same system when heating gutta percha, and by these means completely purify it. I then dissolve it in the alcoholized sulphuret of carbon, and dilute it until it arrives at the state of thick syrup of sugar, and leave it to remain in that state for three or four days. The impurities will deposit themselves or swim on the surface. I draw off the centre part, which gives the gutta percha in a state of complete purity. Thus it will be seen that the character of the invention is the mixture of alcohol with the solvent used for dissolving caoutchouc. Alcohol, as is well known, being the liquid which precipitates most quickly india-rubber from its solutions; it is this property of the alcohol which I have applied to this purpose. In causing the alcohol by means of a solvent to enter into the interior parts of the caoutchouc, or to better express it, I detach all the adherent atoms which form the mass of the caoutchouc, as will be easily seen in a clean solution, to which is added the alcohol; these particles become less adherent among themselves, and are easily separated by pressure, which can be given, preferring always the form resulting from this pressure, and not returning, as with the caoutchouc, to their ordinary form. The solvent and the alcohol being evaporated, the rubber will return to its original state. The alcohol I prefer to employ to mix with the solvents, such as spirit of wood, oil of potato, and all liquids which possess the properties of alcohol; but it would be difficult to define all the liquids which would act according to my invention for the purpose of precipitating the caoutchouc for its solutions. I should comprise all liquids which have not

the property of dissolving the india-rubber, and which can be introduced into the gum by means of a solvent. I have, therefore, only indicated those which experience has proved to be successful, but I wish it to be understood that the principle of my invention is the causing matters which are not of a solvent nature to be introduced into the body of the rubber by means of a solvent, and having the property to disunite the parts constituting the mass of rubber and destroy the adherence of the particles, whether these matters are combined with the solvents or introduced by themselves.—In witness, &c.

GUSTAVE EUGENE MICHEL GERARD.

Enrolled October 7, 1850.

Specification of the Patent granted to JOSIAH BOWDEN, *of Liskeard, Linendraper, and* WILLIAM LONGMAID, *of Beaumont-square, in the County of Middlesex, Gentleman, for Improvements in the Manufacture of Soap.*—Sealed July 4, 1849.

To all to whom these presents shall come, &c., &c.—Our invention consists of improvements in manufacturing soft soap, when rosin and tallow are used. Heretofore, when such descriptions of soft soap have been made, it has been usual first to manufacture hard soap, and then to make the same into soft soap. Now, by our improvements, the raw materials (rosin and tallow) are converted directly into soft soap. In carrying this invention into practice, we first make an alkali-lye of about the strength of five twaddles hydrometer, and we prefer to use soda-ash of the strength of eighty degrees, carbonate of soda to twenty gallons of caustic-lye; we add about twelve pounds of tallow and eight pounds of rosin (the quantity of solid matter may be varied according to circumstances); when the tallow and rosin have been dissolved, we allow the mass to boil twenty or thirty minutes; the operation is then complete, and the soap may be ladled into suitable vessels.

Secondly, to a lye of the strength of four twaddles hydrometer, we add sufficient caustic potass to increase

the strength to five degrees and proceed as before. In this case also the materials may be varied in their relative proportions, so long as the peculiar character of the process is retained.—In witness, &c.

JOSIAH BOWDEN.
WILLIAM LONGMAID.

Enrolled January 4, 1850.

LAW REPORTS OF PATENT CASES.

IN THE MATTER OF THE EXTENSION OF FRANCIS PETIT SMITH'S PATENT.

In the Privy Council.—Present: Lord Brougham, Lord Langdale, Lord Campbell, the Chancellor of the Duchy of Cornwall, and the Judge of the Admiralty Court.—February 11, 1850.

Sir Frederick Thesiger appeared as Counsel for the petitioner.

Mr. Attorney-General appeared on behalf of the Crown.

Mr. Crowder.—I appear, my Lords, as Counsel for the Admiralty, and I have an application to submit to your Lordships before this case is heard. I am instructed on the part of the Admiralty to apply to your Lordships that a *caveat* may be entered on their behalf against the extension of this patent. Undoubtedly notices have been published, I believe in the usual way; but it did not come to the knowledge of the Lords of the Admiralty that the case was to be heard until it was too late, according to the rules of your Lordships, that a *caveat* should be entered. The matter is one of great importance to the public service, and there are circumstances which the Admiralty are anxious to bring before the consideration of your Lordships, which may either induce your Lordships not to grant an extension of this patent, or to grant it with certain conditions imposed.

Lord Campbell.—Cannot this be done by the Attorney-General if the public service is interested?

Mr. Crowder.—I fear not. The Attorney-General is here to speak for himself.

Sir Frederick Thesiger.—I understood from my Learned Friend, Mr. Crowder, who is Counsel for the Admiralty, that the object was to have some clause introduced into the patent, supposing it to be extended, which should give to the Admiralty the benefit of the patent under certain terms and conditions. Now, in the first place, it is extremely hard that we having given all the notices and having at enormous expense brought our witnesses here for the hearing to-day, my Learned Friend should interpose almost at the last moment and beg for a delay, for some undefined purpose, which the Admiralty have in view——

Mr. Crowder.—It is not an undefined purpose. I am ready to state what the purpose is, and also to state further that probably if terms were introduced, such as I have mentioned, there would be no objec-

tion to the extension of this patent. The Admiralty are here, and are anxious to have this matter brought before your Lordships.

Lord Brougham.—What time do you require? Because the objection of Sir Frederick Thesiger is a very serious one. It is very hard upon the parties, after they have made all their arrangements for the hearing to-day to have a postponement applied for.

Lord Campbell.—I cannot understand why the Attorney-General should not do all that the public interests require.

Mr. Crowder.—We wish to enter into an examination of a matter that may be very important for your Lordships' consideration, but which we have not had an opportunity of doing.

Lord Brougham.—How long do you require?

Mr. Crowder.—I imagine a very short period. It is with reference to the peculiar circumstances in which the Admiralty are placed with reference to this matter, and the way in which the public service might suffer most materially if this proceeding were to go on without this subject being brought under the consideration of your Lordships. It is believed that the present patentee, together with, I think, four or five other patentees, one of whom has already applied for an extension——

Lord Brougham.—This seems to be a most inconvenient application.

Lord Campbell.—The case is actually called on.

Mr. Crowder.—I received my instructions on Saturday, and I appear before your Lordships at the first moment that was possible. The Lords of the Admiralty were only aware of the application on the 5th of February, and they immediately caused a report to be made, which states the circumstances under which I am instructed to appear. It is suggested that this patentee, together with, I think, four or five other patentees, have united together for the purpose of obtaining an extension of this patent, and if it be obtained the Admiralty will be placed in this position, that, being obliged, as they have been for some time, to build the ships of Her Majesty in private yards, terms may be imposed upon them, that is, upon the contractors in the private yards in which the ships are built, to almost any extent, charging an amount which would make it of the utmost inconvenience to the public service that such imposition should take place——

Lord Brougham.—Why cannot that point be taken in argument?

Mr. Crowder.—It is necessary first to lay the ground, (which I am not in a condition to do now,) that there is this combination, and by laying before your Lordships the manner in which the Admiralty have been now, for some years, under the necessity of building ships in private yards. I have a history of about thirty-two vessels——

Mr. Attorney-General.—Of course, if your Lordships do not allow the Admiralty to appear by their Counsel and call evidence I shall be obliged on the part of the public to do so. I thought it convenient that I should not lose the position which I generally hold as between the patentee and the public. But if the Admiralty are not allowed to appear, I must on the part of the public appear and call witnesses.

Lord Brougham.—You have a perfect right to do so. I think it would be a very strong measure that when the case is actually called on, upon a suggestion which might have been acted upon long ago, we should put it off, when there are competent parties before us to take care of the public interests.

Mr. Crowder.—I was instructed to appear on behalf of the Admiralty. But if the Learned Attorney-General can be permitted to appear for the same purpose, that will provide for the interests of the public service.

Sir Frederick Thesiger.—I appear before your Lordships on behalf of Francis Petit Smith, one of the petitioners who are named in this petition, praying your Lordships——

Mr. Attorney-General.—Will your Lordships forgive me for stating the proposition I wish to make on behalf of the Admiralty, in order that my Learned Friend may consider it. It is alleged, and I believe with perfect truth, that there are agreements entered into between the four or five patentees of the Screw Propeller. Each of them has a certain portion of the invention, and their several patents combined produce an effective screw. And the result will be that if this patent shall be extended without condition on behalf of the public service, there will be no competition between the patentees, and they will be in a condition to enforce any demands they please against the public service. We therefore suggest that there should be inserted a clause, not only permitting the Crown to make the patent propeller, as of course it may do now, but allowing it to cause it to be manufactured for the purposes of the public service.

Lord Campbell.—We are authorized by law to extend the period upon any conditions when we have heard the case.

Mr. Attorney-General.—I throw it out now, because as my Learned Friend has been considering it, possibly he may not object to that condition.

Sir Frederick Thesiger.—I need only call your Lordships' attention to this fact, that in the patent itself there is all the power given which my Learned Friend desires; for there is a clause that if Francis Petit Smith does not supply or cause to be supplied for such service all such articles of the said invention, and so on, which he shall be required to supply in such manner, at such time, and at and upon such reasonable prices and terms as shall be settled for that purpose by the Master-General of our Ordnance, and so on, then the letters patent shall be void.

Lord Campbell.—We had better proceed.

Mr. Attorney-General.—I only threw that out because possibly it might save time. If my Learned Friend thinks that the patent now gives what we ask, he will have no objection to that condition.

Lord Campbell.—We shall understand it better as we go on.

The Attorney-General.—If your Lordship thinks it better to hear it for two or three days—

Sir Frederick Thesiger.—Your Lordships will not be alarmed by any threat of the time which this case may last. I am not apprehensive that it will require any considerable portion of your Lordships' time. Certainly I shall endeavour to compress the introductory part of the case into as small a compass as possible.

My Lords, it is an application for the extension of a patent that was granted in May, 1836, to Francis Petit Smith, for his invention of an improved propeller for steam and other vessels. It would be necessary that I should explain to your Lordships the reason for the introduction of other names into the petition, because the question may arise, if it should be your Lordships' pleasure to grant an extension of this patent, to whom that extension will be granted. Your Lordships are aware, that, in these patents, there is invariably a term introduced that it shall

not be assigned to more than twelve persons. Mr. Smith not being a person in affluent circumstances, was assisted originally in taking out his patent by two gentlemen, of the names of Reid and Caldwell. They associated themselves with others in the year 1838, in forming a Ship Propeller Company. The Ship Propeller Company agreed to take an assignment of the patent of Mr. Francis Petit Smith, which of course could not be done by law without an Act of Parliament. And, accordingly, in 1839, an Act was passed which formed and regulated a Company to be called the Ship Propeller Company, and to enable the said Company to purchase the letters patent; and by the third section of that Act of Parliament, the patentee, Mr. Smith, was empowered to assign the letters patent to the Company without forfeiture. Under the provisions of this Act of Parliament various assignments took place, but it is quite sufficient for this purpose to say, that those assignments ultimately vested in the parties who appear as petitioners before your Lordships as having an interest in this patent.

My Lords, on the part of the petitioners, I have to lay before your Lordships such circumstances as to the merits of the invention, and as to want of proper advantage and benefit derived from it to the parties, as may induce your Lordships to grant them the extension which they pray. Your Lordships observe that this is an invention of an improved screw propeller. Now, of course, I am not here to say that Mr. Smith was the inventor of the screw propeller, because your Lordships are perfectly aware, that long before the year 1835, when Mr. Smith first began his experiments upon this subject, the screw, as an instrument of propulsion, had been known to the scientific world. There had been various patents which from time to time had been taken out, but I think I am entitled to say that Mr. Smith will be found to have had all the merit of inventing that which has rendered the screw propeller practically useful; and that it is owing entirely to his untiring energy and perseverance, that he has at last forced the subject upon the public notice and showed the advantage of the combination which he had discovered, and by which alone it can be useful for practical purposes, and it has been found of the greatest possible utility.

Lord Campbell.—You say that he was the Watt of the screw propeller.

Sir Frederick Thesiger.—Certainly, there is no doubt of it. The patents, which I merely mention in passing, were one by Mr. Bramah, in 1785; by Littleton, in 1794; by Shorter, in 1800; by Trevithick, in 1815; by Millington, in 1816; by Cummerow, in 1829; and by Woodcroft (which your Lordships will recollect), in 1832. But none of these had been applied to practical purposes, and it was not till Mr. Smith's invention, made under the circumstances which I am about to state to your Lordships, that the screw propeller was applied and used so as to show the vast advantage and benefit of the invention.

In the year 1835, Mr. Smith, who had occupied a farm at Hendon, had his attention called to the subject of screw propulsion, and he made some experiments, of course upon a very small scale, upon a pond on his farm. He cut the screw himself, and he applied it to a little boat, inserting it in the deadwood which is at the stern of the boat; the solid wood of the stern, that which has not the buoyancy of other parts, and is, therefore, called the deadwood. And, I believe by means of clockwork machinery, he worked the boat upon his pond, and he contrived, I think, to get a speed of about three knots and a

half an hour. At that time, the screw which he used was a one-threaded screw of two turns and half of another turn.

Lord Brougham.—Is he an engineer?

Sir Frederick Thesiger.—No, my Lord. He is now, but he was not then. Even at that early stage of his experiments, the advantage of his invention was so obvious that a gentleman of the name of Bell, of a firm at Alexandria, offered to purchase the model for the Pasha of Egypt. However, Mr. Smith refused to dispose of it. It was afterwards exhibited in the Adelaide Gallery, where it was seen by Sir John Barrow, who was then Secretary to the Admiralty, and by other persons. He afterwards built a boat of six tons for the purpose of trying this screw in the boat, and I believe with a steam-engine of four-horse power, and this boat was tried upon the City Canal, and upon the Thames. The great difficulty which he had to contend with was the want of steam power. But, however, he succeeded in ascertaining that the screw, placed where he placed it, would be an extremely useful instrument, and he continued his experiments from time to time for a very considerable period. In the course of those experiments he discovered that two turns and a half was more than necessary where he wanted speed; that it was useful where no great speed was required, but that by reducing the number of turns of the screw you accelerate the speed; and accordingly he reduced it ultimately to one turn of a one-threaded screw. He continued to try this little boat, and after having tried it for months upon the river and the canal, he determined to try an experiment by going to sea with her, and he went as far as Dover. On his return from Folkstone, I think to Hythe, which is a distance of five miles, the wind being dead in his teeth, he ran in three quarters of an hour a distance of five miles; and he afterwards proceeded towards London in very strong weather, certainly not weather for which such a small vessel as he was in was adapted; but she made her voyage uncommonly well, and clearly showed that the screw was extremely well calculated to be worked in water of that description.

In this way he gradually forced himself into public notice, until, in the year 1838, he was permitted to make an experiment in the presence of the Lords of the Admiralty. Some accident, I think, occurred to the screw, the wooden screw broke at the time when the experiment was to have been made, and an iron screw was substituted; and about a month after that, the little boat was tried in the presence of the Lords of the Admiralty, for two successive days, near Whitehall. They entirely approved of it, and the power of the screw was tested in a most remarkable way afterwards; for this little boat of six tons actually towed the British Queen some considerable distance, and towed a vessel called the Lord William Bentinck, a vessel of 500 tons, heavily laden, into dock. It was quite obvious, therefore, that the screw placed where it had been placed by Mr. Smith was a thing calculated of great public advantage; and the Ship Propeller Company, therefore, were disposed to take up Mr. Smith's invention, and it was in the year 1839 that they obtained their Act of Parliament, as I have already mentioned to your Lordships.

My Lords, in the meantime Mr. Smith had discovered, by various experiments which he had made, that the deadwood was the only useful position in which this screw-propeller could be placed. Your Lordships will find in his first specification that he had taken power to introduce this screw propeller.

Lord Brougham.—How many specifications had he?

Sir Frederick Thesiger.—We have a disclaimer afterwards, which is a specification. I was about to explain that. He says in his specification, "And whereas the propeller may be made of wood, sheet-iron, or other suitable material, and with a greater number of threads or worms, and set at various angles," and so on. "But whereas I claim as my invention the propeller hereinbefore described, whether arranged singly in an open space in the deadwood, as here shown, or in duplicate with one on each side of the deadwood, or otherwise placed more forward, or more aft, or more or less deep in the water."

My Lords, I told your Lordships that he had discovered by his repeated experiments that the only practicable place, or the only useful place, for putting the screw propeller was in the deadwood; and, therefore, in 1839, he entered a disclaimer under the recent Act of Parliament, by which, instead of the words I have read to your Lordships, he inserted the words "described in figs. 1, 2, and 3 of the drawing annexed to this memorandum of alteration, and placed singly in the centre of the deadwood or run of the vessel, as shown in the figures of the drawing annexed to the original specification." So that your Lordships see that by that disclaimer he confined himself entirely to that part of the vessel which is called the deadwood.

My Lords, the Ship Propeller Company, after they had obtained an assignment of the patents, proceeded with a vessel which had been previously building. It was commenced, I believe, in 1838; a vessel called the Archimedes. She was of the burden of 237 tons, and she was intended to have a pair of engines of forty-five horse power each. This vessel was afterwards built, and a screw propeller was applied to her, and before her own engine was put into her, in order to try the power of the screw; the small engine was taken out of the boat of six tons, which had then been laid up, it was applied to this large vessel, the Archimedes, and it actually had the power to take her, I think, from the place where she was, some distance, to Millwall, and afterwards to the West India Docks, and she was running up and down the West India Docks, in the presence of several persons, merely by means of this screw. She was taken first of all experimentally to Gravesend, where her speed proved to be at the rate of eight knots an hour. She had, I think, two screws, which were made originally, one seven feet diameter, and the other six feet six inches. She was first tried with a screw of seven feet diameter, and then her speed was eight knots an hour. She was afterwards tried with the other screw of six feet six inches, and her speed upon two successive trips, I believe to Ramsgate and homeward, was at the rate of nine knots an hour. She was sent to Dover for the purpose of trying her speed with some of the packets and other vessels on that station, and she ran with them, and upon every occasion I believe, at all events when the weather was not very moderate, her superiority was striking. The Admiralty afterwards sent down Mr. Lloyd and Captain Chappell to witness those experiments, and the speed of the Archimedes was tried in their presence against the Widgeon, which I believe was the fastest boat upon the station. And the result of all those experiments, which will be stated to your Lordships if necessary, by witnesses who were present, was that in fine weather the Archimedes was certainly equal to the Widgeon, and in bad weather she was very superior. Captain Chappell, who had been sent down by the Lords of the Admiralty to witness those experiments, afterwards went

round the island, round Great Britain nearly, in the Archimedes. The voyage, I believe, lasted altogether about seven or eight weeks, of course visiting different points in their way, and that gave him ample opportunity of testing the advantage of the screw-propeller in the place in which Mr. Smith had placed it, and I will presently exhibit to your Lordships some striking instances of the advantage of that position in the vessel. I believe the Archimedes was afterwards sent to Oporto, to Belgium, and to Holland, under the superintendence of Captain Chappell. She was exhibited to different Governments, and ultimately she came home, and was laid up in the year 1840, and was not used again until the year 1841, when the Ship Propeller Company allowed Mr. Brunel, the celebrated engineer, to have her for the purpose of experiments, which lasted, I think, for a period of about seven months, and he was so satisfied with regard to the screw-propeller that he recommended that it should be applied to the Great Britain, which was then building under his superintendence.

My Lords, all these various struggles on the part of Mr. Smith to attract public notice, which I have not described to you in minute detail, at last satisfied the Board of Admiralty of the advantage of his screw-propeller; and they, therefore, having a vessel called the Alecto, which had been fitted up with paddles, directed that another vessel called the Rattler should be built, a sister vessel to the Alecto, and that she should be fitted up with Mr. Smith's screw-propeller. I think she was laid down in the year 1840, but she was not completed until the year 1843. Various experiments took place with that rival vessel (if I may so call her) the Alecto, and it appeared that the Rattler had a striking superiority over that vessel. They then tried this experiment. They fastened the two vessels together by their sterns, and put on the power of their engines, and the Rattler drew the Alecto by the stern two knots and a half an hour.

Lord Langdale.—Ran off with her.

Sir Frederick Thesiger.—Notwithstanding her efforts at resistance, notwithstanding that she endeavoured to get forward, the Rattler actually drew her backward at the rate of two knots and a half an hour. Some experiments were afterwards tried between the screw and the paddle upon two other vessels with the same result. There can be no doubt, therefore, of the vast superiority of this screw propeller over the paddle-wheel. The Alecto being a Government vessel, one cannot imagine that it was anything but a fair trial of strength between them, because they were sister vessels. The Rattler was built expressly for the purpose of testing the value of the screw against that of the paddle-wheel. Therefore, one may say that it was a fair experiment, especially when it was tried upon two other vessels with the same result.

But your Lordships will observe the great superiority of the screw over the paddle for many other purposes. In the first place, in a man-of-war the position of the screw protects it entirely from any harm or danger from shot. There is another great advantage too with reference to placing it in the deadwood, which is that it takes nothing from the stowage of the vessel. There is no stowage in that part. It is solid.

Lord Langdale.—Except for strength, it is of no use at all.

Sir Frederick Thesiger.—Except for strength, it is of no use at all. The screw may be used there without any diminution of the vessel's strength. Now it is very clear that if the screw were used at the bow, as some of these patents propose to use it, it would be exposed to

continual danger of being carried away with a head sea. Or if it were in the middle of the ship, there would be many disadvantages attending it, and certainly it would interfere very considerably with the stowage. Besides, for a man-of-war steamer it has a great advantage over the paddles in having the whole range of the deck for the entire broadside of guns, which of course the paddle would interfere with, and it would also interfere with the direction of those guns which were near the paddle-wheel. Then, again, the vessel may be fitted up entirely as a sailing vessel, and you may use her as a sailing vessel, taking the screw up and putting it entirely out of the reach of harm, and out of the way of any interference with the vessel, and she may be rigged and used completely as a sailing vessel. Therefore, the great advantages of the screw over the paddle-wheel will be admitted.

But the whole of the advantages which we claim, and the great merits of the scheme in this case, arise from the particular position of the screw propeller in the deadwood of the vessel, some of which are remarkably striking. In the first place, with respect to the power over the vessel, your Lordships are aware that a vessel making her way through the water leaves a sort of cavity or trough astern, which is almost immediately filled up by the water flowing in from the sides and from abaft, the consequence of which influx is that the flowing current acting upon the propeller placed in the situation in the deadwood in which Mr. Smith places it enables the vessel to accomplish her speed by fewer revolutions in the same time than if she had not the advantage of that current. Of course, that could not be obtained by placing the screw propeller either in the fore-part of the vessel or in midships.

But there is one much more remarkable circumstance, and which has astonished all the gentlemen who have witnessed the fact. It is the effect upon the steerage of the vessel. Under ordinary circumstances unless a vessel has headway, her helm has no power over her. It appears that when the screw propeller begins its action, it throws a stream of water upon the rudder, which actually will turn the head of the vessel one or two points. The effect of this stream of water is strikingly exhibited in the course of the vessel. Captain Chappell, who has had such ample opportunity of observing the action of this screw, will tell your Lordships the effect of that stream of water impinging upon the rudder by means of the action upon this screw in the position in which it is. It operates as what is called a rudder-check, to keep the rudder in midships; and in tolerably smooth water, Captain Chappell has actually taken the steersman away, and allowed the vessel to steer herself, and she has gone for six or seven miles without deviating more than perhaps a quarter of a point from her course. The facility which this gives to the steerage is most remarkable also, and will be exhibited to your Lordships in some very interesting details by Captain Crispin, who commands the "Fairy," the Royal yacht, the tender upon the "Victoria and Albert," and who has succeeded in steering that vessel at once into Dock by means of this screw, whereas it would have been necessary to have had wheels and cranks and buoys to have got the vessel into the docks, into which he steered with the greatest facility by the means of this screw under the circumstances, and, as he says, a child could have steered the vessel into that dock.

There is another remarkable thing also. By means of the facility with which a vessel may be handled, in consequence of the position of the screw and the circumstances which I have mentioned, she may be

put about in a wonderfully small range. Captain Chappell will tell you that this experiment was made upon the Archimedes, that the tiller was carried over one side. The Archimedes then went round, she performed one circle, and she then performed a smaller circle, but the smaller circle I must state in a longer space of time, in consequence of the rudder placed as it was acting as a drag upon the stern; but the second circle was smaller than the first, and the result was that the vessel going round and round in this way, in circles, turned as it were almost upon a pivot, a circumstance perfectly new in navigation, a manœuvre unknown and unheard of before. The same experiment was tried, I think, by Captain Crispin, who was requested to take charge of the "Arrogant," fifty-gun frigate, and in presence of Admiral Bladen and other naval officers, he went out with her to Spithead, he then threw a plank overboard, and he put the vessel about, and she went round this plank, never being at a greater distance from it than thirty yards, so that she went about in a radius of thirty yards. Now this is very striking. All the witnesses who will be called before your Lordships will state that before Mr. Smith's invention nothing of this kind was ever known, or was ever used; that it is entirely owing to the perseverance and industry and determination of Mr. Smith that this most important and useful invention has been forced into public notice. And now the question is, what benefit Mr. Smith and those who represent him upon this occasion have derived from this invention, and whether he does not come before your Lordships with a good case to ask for an extension of the term of his patent?

My Lords, upon this part of the case, my statement will be very short indeed. It may be asked, what profits have we derived from this invention? Not one farthing; on the contrary, there has been a very considerable loss. Therefore, without entering at all into the details, showing how I make out that part of the case, because it will be made out in detail by the evidence before your Lordships, I have endeavoured as shortly as I can to state to your Lordships, what is the nature of this invention, and what is the peculiar merit which is due to Mr. Smith in this matter. I have told your Lordships, that I shall prove he has derived no benefit whatever from it, and then I will ask your Lordships, whether it is an unreasonable hope that we entertain that, proving these facts before your Lordships, we shall have an extension of this patent for the whole time, which, by law, you are empowered to give it.

Lord Campbell.—To what extent has this screw been adopted?

Mr. Attorney-General.—It is universally adopted.

Lord Campbell.—It is now universally adopted in all the war steamers?

Mr. Attorney General.—Yes.

Sir Frederick Thesiger.—There has been a great deal of litigation which has prevented its getting more extensively into use.

Lord Campbell.—But it is introduced into the Queen's ships.

Sir Frederick Thesiger.—Yes, very extensively.

Mr. Attorney-General.—Thirty-two vessels have been built by the Government with a screw, but not this screw.

Sir Frederick Thesiger.—By various experiments, the Admiralty have ascertained the segment of a screw which is best adapted for the purpose of screw propulsion. They have preserved the principle of the

screw, because the segment of a screw acts upon exactly the same principle, and when my Learned Friend, the Attorney-General, says, "not this screw," I say, they have used this screw of Mr. Smith, but Mr. Smith does not place his merit upon the use of the particular screw, so much as upon the place where he has fixed the screw, and which, I say, is accompanied with all those advantages which I have pointed out, and which have led to its adoption.

Mr. Attorney-General—I think it will turn out in discussion, that the screw which is used both in the merchant service and by the Admiralty, is a compound of three or four.

Lord Campbell.—Would the use of it be an infringement of Mr. Smith's patent?

Mr. Attorney-General.—We tried an action in the Exchequer, my Lord, on that very point, and I got a verdict for the defendant upon that ground.

Sir Frederick Thesiger.—My Learned Friend says, they tried the case of Back *v.* Steinman, and that he got a verdict for the defendant. That was an action for the infringement of this patent of Mr. Smith's. There were, as your Lordship knows there always are, a variety of pleas upon the record, among them one of Not Guilty, which denied the infringement. All the other pleas establishing the validity of this patent were found for the plaintiff. The verdict for the defendant was upon the ground of there being no infringement. The question as to whether there was an infringement or not arose upon the fact of whether the defendant placed his screw in the deadwood or not because it was admitted on all hands, that if he placed his screw there, it was an infringement of this patent. Therefore, when my Learned Friend says, he got a verdict for the defendant, it is true in one sense, but it is not true as affecting the validity of this patent because that verdict established the validity of Mr. Smith's patent All those pleas which went upon the originality and usefulness and so on, were found in favour of Mr. Smith's patent.

Mr. Attorney-General.—It established that we did not use this screw, but a compound screw.

Sir Frederick Thesiger.—That they did not use it in the deadwood.

Witnesses were then called to the sufficiency of the specification and utility of the invention.

Mr. Attorney-General.—My Lords, I appear here for the Government, that is for the public. I take it, that if I can satisfy your Lordships, as I believe I shall be in a condition to do, that this application is made not on behalf, solely of the patentee and the assignees of the patentee, but on behalf of an Association who have combined together for the purpose of doing that which hitherto the accounts show they have been unable to do from the insufficiency of different patents; the propeller used being in truth a combination of different patents; if I can satisfy your Lordships, that the application is made on behalf of a number of people who violate the condition of the patent, which is, that it shall not be assigned to more than twelve, for the purpose of preventing monopoly,—your Lordships will be inclined on behalf of the public service, either to impose such terms upon your extension, as will not enable them to force their monopoly on the Government, or to refuse an extension altogether, so as not to give them an opportunity of oppressing the public, by the actions which they will be in a condition to make.

With respect to the remuneration which they say they have not received, it is strange if Mr. Smith be the inventor of a patent, which is now in general use, as my Learned Friend says, that now in the year 1850, the patent being about to expire, they have never received from the numerous merchant vessels which use this patent, or from Government, any remuneration for what they have done. But I shall prove to your Lordships, that in thirty-two instances, screw propellers, founded in fact upon the improvement of the screw, which is a combination of various previous patents to which I shall refer, in thirty-two cases have private engineers applied the propeller to Government vessels. In each of those cases, if they could have established their patent, they would have had a perfect right to have recovered against them that remuneration; and there has been paid by Government, or an engagement made by the Government, to pay to those engineers indemnity for any claim which might be made a sum larger than the amount which they say they have lost, namely, the sum of 25,000*l.* That has been paid to Mr. Maudsley, Mr. Penn, Mr. Galloway, and various other engineers at the rate of 2*l.* a horse, being the amount which they charged, but which in the uncertainty of these patents, and having tried them over and over again, and not being successful upon each, no one has had a right to enforce against any individual. Consequently, the five patentees, Mr. Erickson, Mr. Woodcroft, Mr. Lowe, Mr. Smith, and Mr. Blaxland have now, as I will show your Lordships, combined for the purpose of mutual defence to enable them as they cannot individually go on with success, to make a stand together, and select parties to attack. The 25*l.* is already paid, or Government is liable to pay it to the engineers, at the rate of 2*l.* a horse, as an indemnity for all these patent licenses, if the parties were liable in making them; and to this moment, not a farthing of this has been recovered or attempted to be recovered by Mr. Smith, who, if his patent be good, might have recovered it, because there is no question that in every one of those cases, the patent has been used as in this vessel, the Rattler, in the dead wood, with a fixed shaft running horizontally with the keel, but with a cut screw as in Mr. Lowe's patent. In no case, I say, have they asserted their right against those persons, or recovered the damages which would have been to them a compensation for the expenditure they have incurred. They have incurred as they say, the large expenditure of 22,000*l.*; Government alone have paid 25,000*l.*, and there are hundreds of mercantile vessels in the same position. So far as the recovery by Mr. Smith against the manufacturers who make it goes, there would be no change of situation, but if the patent is to be extended, and that is followed by a combination of five or six of these parties, they will be in a far better situation then; because you cannot then, I apprehend, assert your rights or try to make a screw under the patent of either Smith, Erickson, or Woodcroft, because they will have entered into one common combination, and you will refuse to grant licenses, unless you come under an obligation to be bound by the terms they propose.

Lord Brougham.—The cut screw introduced originally by Erickson, he patented, which was said to be something like the vane of a smoke-jack.

Sir Frederick Thesiger.—That was after Mr Smith's.

Mr. Attorney-General.—Woodcroft's was before.

Sir Frederick Thesiger.—That was not in the deadwood.

Mr. Attorney-General.—Woodcroft had a fixed shaft before Mr. Smith. Then came Mr. Smith with an entire screw, with a fixed shaft in the deadwood. Erickson has a cut screw not in the deadwood, but working with an outrigger, so that you have a fixed shaft running horizontally with the keel in Mr. Woodcroft's, the deadwood which is Mr. Smith's, and the cut screw which is Mr. Erickson's, and then follows the combination of Mr. Lowe, who has a cut screw in the deadwood working with a fixed shaft. In truth, therefore, what is now in use is this, and it has been contested—

Lord Brougham.—Sir Frederick Thesiger, in what way do you shape your case in this respect? Generally speaking, we should say, if a person takes out a patent and does not try to gain the benefit of that patent, by endeavouring to sell or to work under it, or to use his monopoly by granting licenses, which comes to the same thing; if there has been no user of the patent for so many years, one should say generally, that that is a case against an extension, because *non constat*, if you had used it, your monopoly would not have suffered to compensate you for your ingenuity and expenses.

Sir Frederick Thesiger.—I thought, my Lord, the user of this patent had been admitted, because we were able to prove the user to the fullest extent. Then, my Lord, as to the payment in respect of that user, we are in this most extraordinary position, that, according to the statement which is now made by my Learned Friend, the Attorney-General, the Admiralty has put into the hands of the engineers 25,000*l.* for the purpose of contesting the validity of our patent.

Mr. Attorney-General.—That is not so in fact, I have not said that.

Sir Frederick Thesiger.—Inasmuch as there has been a great deal of litigation upon the subject of these different patents, the Admiralty has refused to pay anybody in respect of the use of our invention.

Lord Brougham.—Have you a contract between you and the Admiralty, by which they were bound to pay you for the use of it?

Sir Frederick Thesiger.—We have applied over and over again for payment in respect of this invention, but the Admiralty will not pay us.

Lord Brougham.—Suppose I am a patentee in the year 1836, and I am aware that A. B. calls at the Admiralty, or anybody else had been using my patent, and I have made repeated applications to be paid compensation by A. B. for that use, there being no contract between us, but a matter of tort rather, namely, an infringement upon my patent, upon which I might maintain an action upon the case, is that such a user of the patent as is sufficient upon your merely saying, the reason why I have not got any money is, that A. B. would not pay me what he ought to have paid me?

Sir Frederick Thesiger.—Your Lordship sees there are various persons who are besieging the Admiralty, and they say, now you must not pay Mr. Smith, because in point of fact that invention is ours.

Lord Brougham.—You must not pay Mr. Smith, you mean with whom those persons have a contract.

Sir Frederick Thesiger.—There is no contract.

Lord Brougham.—If there is a contract, there is user whether you are paid or not.

Lord Campbell.—What enjoyment have you had of this patent for the last five years?

Sir Frederick Thesiger.—We have been struggling with the great difficulties which we have had to encounter to bring out this patent. We have been met by various persons saying that our invention would not answer. We have been met by a variety of persons who have been besieging the Admiralty and saying, that is not Mr. Smith's invention; it is ours. And no less than thirty-two experiments have been made upon the Rattler alone with regard to the different screws of different persons, each claiming the merit of that invention, and ultimately it was found that Mr. Smith's screw was the best of them all.

Lord Brougham.—But you have not used it.

Sir Frederick Thesiger.—We brought an action for infringement; we have done everything that we could do.

Lord Brougham.—That is not your using it.

Sir Frederick Thesiger.—And then, my Lords, just see the situation in which we are placed. The engineers make those different screw-propellers for the Admiralty, Mr. Smith, and other parties; but Mr. Smith, who is sufficient for my purpose, says, that is my screw-propeller which you have furnished to the Admiralty. He applies to the Admiralty for payment for the use of his screw-propeller. Upon which the Admiralty says, there are four or five different persons who say, that is not your invention, but it is their invention, and they claim to be paid for it. We do not know therefore to whom we ought to pay this. We will therefore pay the engineers themselves a sum of 25,000*l.*, by means of which if any action is brought against the engineers, for making without a license, th[illegible] the means of defence of resisting it and defeating the party bring[illegible] It was only about 1846 that the experiments with regard to the screw were made.

Mr. Attorney-General.—1845.

Sir Frederick Thesiger.—All those experiments that were made upon the Archimedes were for the purpose of testing the advantage of our screw. They were made from time to time, and then the Admiralty directed that a vessel should be laid down, the Rattler, with this screw. She was not completed till the year 1843, and it was not till the year 1846 that any vessels were built with this screw.

Lord Brougham.—This case differs from all which have ever come before us in this respect, that in former cases the party was always in the actual enjoyment of the patent; be the enjoyment less or greater, still he was in the enjoyment of it, and he had done all he could to get a larger profit. I do not think you have done anything. You have not used it; that is, you have not been in the enjoyment of it.

Sir Frederick Thesiger.—It was not till within a very recent period that the public was satisfied with respect to the utility of the invention. We have been struggling with all those difficulties in forcing this invention upon public notice. It was in fact owing to the energy and perseverance of Mr. Smith that this screw-propeller has been forced into use. We have had to encounter the greatest difficulties, and yet when we apply to the Admiralty we are met by that answer; that other parties claim the merit of the invention and that they cannot pay us.

Lord Campbell.—Use by others without enjoyment by you raises the difficulties. If, for example, you had published an advertisement

in the "London Gazette," saying that the public generally might make use of your screw, you could not apply for an extension of the patent.

Sir Frederick Thesiger.—It is only recently that the public have been using it; certainly not before 1846.

Mr. Attorney-General.—1843 was the first.

Sir Frederick Thesiger.—The Rattler was an experimental vessel, but it is not till the year 1846 that other vessels have been fitted with it.

Mr. Attorney-General.—1845.

Sir Frederick Thesiger.—We were paid in the case of the Great Britain. The Great Britain had our screw-propeller in her. We were paid for the screw-propeller which was supplied to the Great Britain. There was another vessel, called the Great Northern, built at Londonderry. She was stated to be 1,500 tons.

Lord Brougham.—When were you paid for the Great Britain?

Mr. Attorney-General.—The dates are not mentioned upon the account. 770*l.* is the total sum they have received on licenses.

Sir Frederick Thesiger.—We received payment in respect of the Great Northern and the Great Britain, and the Princess Royal, which was for a Brighton Company. Your Lordships see with respect to this public use of it we are encountered by a very formidable body, the Admiralty, who have almost the power to dictate to us their terms. Why did they pay that 25,000*l.* over to the engineers? It was due to those who were entitled to the benefit of the invention. They should most unquestionably, if there were any doubt whether in a contract between the parties, one was entitled to the invention or another, have retained the funds in their own hands till it had been satisfactorily determined, but instead of that——

Lord Brougham.—It is suggested by one of their Lordships that if you had thought this matter had been contested you might have been prepared to prove it. Do you consider that anything that passed either from the Court or from the other side of the bar, by way of admission, really, candidly speaking, prevented you from giving the evidence of enjoyment which you were prepared to give. Your present answer is an argumentative one.

Sir Frederick Thesiger.—I have told your Lordships that I believe the only opposition that would be made by the Attorney-General upon this occasion, from what fell from him, would be as to introducing some conditions by which the Admiralty should have the use of the invention.

Mr. Attorney-General.—I stated that I was bound to appear on behalf of the public. My Learned Friend applies for an extension upon the ground that he has not been remunerated for his expenses and his science, and so on. If your Lordships extend the patent upon that ground, to-morrow, after the extension, he may sue the engineers who have fitted up the Government vessels since the year 1845, and may likewise sue every one of the merchant ships which he says use his patent; 25,000*l.* being the amount for 13,000 the horse-power.

Lord Campbell.—He may do so, whether we extend it or not.

Mr. Attorney-General.—But then he obtains compensation by such actions, here he will have been remunerated to that extent, and so he cuts down the ground for an extension.

Lord Brougham.—I think it would be hard if we, as the condition

of giving him an extension, were to impose upon him an abandonment of any claim which he may have.

Mr. Attorney-General.—No; but a man cannot say I will not sue you in order that I may make a claim to the Privy Council, and then the moment he has succeeded turn round and sue him.

Lord Brougham.—He would be very well pleased to get it, *quacunque viâ*, of course.

Sir Frederick Thesiger.—The Admiralty have never objected to pay us, but they said that they entertained some doubt whether we were the parties entitled to receive it. That has been the difficulty all along. We have been endeavouring to obtain the sanction of the Admiralty for the payment to us.

Judge of the Admiralty Court.—After all, credit might have been given to so large an extent, and if the payment had been enforced he might have received a very large sum indeed.

Sir Frederick Thesiger.—Your Lordship sees we could not have done that. The 25,000*l.* which is the whole sum which has been paid over by the Government to the engineers would not have brought us up to the amount of our expenditure, which amounts to 29,000*l.*

Mr. Attorney-General.—There are 100 merchant vessels who use the invention. The instant this patent is extended and the five parties agree, they may come and ask for the money, or Mr. Smith may get the compensation. Then that should be thrown into the consideration of the case now before your Lordships.

Lord Brougham.—Do you think you can say that it is to be taken as part of the gains of a patentee, that he gets damages for an infringement of his patent?

Sir Frederick Thesiger.—Mr. Smith failed originally in that action, but he brought another.

Mr. Attorney-General.—[illegible]ows us to go on committing what he says is a tort, and does not enforce a claim against us. That seems a strange position to have been in since the year 1845.

Sir Frederick Thesiger.—Though in the action which has been referred to, the validity of our patent was established, the verdict was for the defendant because there was no proof of infringement. We failed upon that question, and we had to pay the costs of that action to the defendant. We have been most unfortunate in our attempt to force a very valuable patent indeed, into use, and to obtain remuneration for it. We have been actively employed from the earliest period. As Captain Chappell said, he never saw a person of such indomitable spirit as Mr. Smith. Mr. Smith supposed that the Admiralty were so far favourable to him that they would not turn against him at the last moment, and say, we have paid over 25,000*l.* to the engineers who have made this screw-propeller for us; the patentees whose invention it is being the parties who would be entitled to it, and that will be an indemnity to them for any actions which may be brought against them for an infringement of the patent. We had expected that we should receive a fair remuneration for that degree of use of this invention.

Mr. Attorney-General.—I must again say, with submission, that my Learned Friend has not answered the difficulty which has been suggested. The whole basis of this application is the want of remuneration. Now, although I quite admit in an action to establish a patent, the party does not in the first case get substantial damages; it is like

a combining tort, and if the thing goes on he will get at last substantial damages. 25,000*l.* at one time can here be got. It is plain that if the parties combine and an application is made to the Admiralty they must pay, for they are liable, and they cannot say to whom are we to pay, when there are five persons here all making the claim, having combined together for the purpose of defeating that answer.

Sir Frederick Thesiger.—My Learned Friend says that Mr. Lowe has the merit of this invention, or at least the merit of the practically useful invention. Why, Mr. Lowe brought an action in 1844 and he has got two verdicts, but he has obtained no fruits of them; he has got no benefit whatever.

Mr. Attorney-General.—The history of that is this. It is true that Mr. Lowe has got two verdicts; the Judge being of opinion that part of a screw was not the screw. The Queen's Bench have granted a new trial and now there is the matter under discussion. In the meantime there is a *scire facias* in the Exchequer, but now he has come in and is one of the five parties. The Propeller Company failed in *Back* v. *Steinman*, the Jury being of opinion that the deadwood which is before the stern was not the deadwood which is meant, the deadwood in the middle of the ship. It is possible that these various Companies established in Antwerp and elsewhere would not have fitted up their vessels at great expense if they had known that there was to be a combination of these different parties to make them pay at the rate of 2*l.* a-horse power.

Sir Frederick Thesiger.—Mr. Woodcroft when he came here had not got anything at all, and yet your Lordships extended his time. The Ship Propeller Company opposed the extension of Mr. Woodcroft's patent. I have a report of that case here, and your Lordships intimated that when Mr. Smith came for his extension he would be entitled to it.

Mr. Attorney-General.—The case of Mr. Woodcroft is not like this. Mr. Woodcroft's screw, which was a screw of a declining pitch, had never been used. Mr. Woodcroft's screw was not used, as this plan had been, for a number of years without an application for a patent. They took Mr. Woodcroft's into the combination because he has a thick shaft, a shaft running parallel with the keel. Then they take Mr. Erickson's because he has a cut screw, and Mr. Smith's because he has the deadwood, and out of the three they compound Lowe's patent, which is now in work. Then, if I can show your Lordships that if there had been vigilance in the exercise of their rights, assuming we are now using the screw, they would have been compensated, the substratum of their application is cut from under them. There is no reason for saying that they have made any profits when they might have recovered 25,000*l.* from the Admiralty.

Lord Campbell.—What strikes my mind is this. For the last five years the owners of this patent seem to have done nothing to render it profitable to themselves. How then can they come at the expiration of the time and say they wish to have the patent extended?

Mr. Attorney-General.—The history of it is this. I dare say that in 1843 experiments being tried successfully with the Rattler, in 1845 it was generally introduced, and there have been thirty-two vessels fitted in that way.

Lord Campbell.—It has been generally used both in the navy and the merchant service.

Sir Frederick Thesiger.—This is not an instrument we could make ourselves.

Lord Campbell.—If it has been made without your license, why do not you enforce your rights?

Sir Frederick Thesiger.—We have been trying to do so. We tried it in the case *Back* v. *Steinman.*

Lord Campbell.—Suppose it were to go on for five years longer, in what better situation should you be?

Sir Frederick Thesiger.—I apprehend now there is a more favourable view taken of Mr. Smith's rights than there was during that time. We cannot make the patent ourselves, and do not profess to do so. We cannot force people to take licenses.

Lord Campbell.—You may say this; "You violate our patent, and we must be compensated for the injury."

Sir Frederick Thesiger.—So we have done.

Mr. Attorney-General.—In one case.

Lord Campbell.—When was the last case?

Sir Frederick Thesiger.—*Back* v. *Steinman* was tried in 1846. The verdict was for the defendant, because it was not proved that there was an infringement of the patent.

Lord Campbell.—There have been innumerable cases since.

Sir Frederick Thesiger.—But Government has been the great user of the invention, and they have been refusing to pay us in respect of the invention.

Mr. Attorney-General.—I am told I can prove that it has been introduced into nearly 100 vessels in the merchant service; not quite of so much power perhaps.

Sir Frederick Thesiger.—If your Lordships will look at the case of *Woodcroft* you will see it is a very hard thing not to extend it in Mr. Smith's case.

Lord Campbell.—Had Mr. Woodcroft waived his right for four or five years?

Sir Frederick Thesiger.—He had done much less than Mr. Smith. He had not in fact done anything.

Lord Campbell.—Had his patent come into use without any objection being made to it?

Mr. Attorney-General.—It had only just come into use; except just at that moment he had had no opportunity for remuneration.

Lord Brougham.—If you had given general leave and license to all the world to use this patent, you could never have come to us for an extension, upon the assurance that you had tried and failed to get a fitting remuneration for that invention. Is not it then something of the same sort to have allowed so many years to have passed without any action being brought except one, there being so many infringements as must have taken place, if it is so generally in use in the merchant service.

Sir Frederick Thesiger.—In the first place, I say the principal use of this was by Government; and it is rather a formidable thing to contest any matter with the Government. The action upon which we failed cost us 2,000*l.*, therefore we had not any great encouragement to bring another.

Mr. Attorney-General.—The Government had nothing to do with that.

Sir Frederick Thesiger.—No; but we were not willing to encounter

the opposition of Government. We wrote to them protesting and making our claim.

Lord Brougham.—As to the merchant service, what do you say?

Mr. Attorney-General.—Mr. Lloyd tells me that that action of *Back* v. *Steinman*, was an action by the Propeller Company against the Government engineer for making the screw. Though the Government had nothing to do with it, it was against the engineer who made it for the Government; and since that time they have allowed us to go on with thirty-two vessels for the Government; and in the merchant service there are nearly one hundred vessels.

Sir Frederick Thesiger.—With respect to the merchant service, I understand the whole amount of horse-power employing this screw-propeller is about 3,000. That at 2*l.* a horse would be about 6,000*l.* We tried one action in which we failed, and had to pay 2,000*l.*

Lord Brougham.—The reason you failed was, that there was no evidence of the defendant having used it. It did not put in issue the merits of your patent in any way, but you simply failed in the action. That was not therefore one of the cases we complain of you for not trying, but we want you to try a case where you can prove that they have used it.

Sir Frederick Thesiger.—That case did put in issue the invention; all these matters were raised and found in favour of the plaintiff.

Mr. Attorney-General.—Then why did not you contest your rights by going on?

Lord Campbell.—For five years an invention has come into general use; the patentee comes to a resolution, that at the expiration of his patent he will apply to have it extended; then having got it extended, he brings an action against all those who have used it within the five years.

Lord Brougham.—I can fancy this [illegible] place, that owing to the long abeyance of the patent a person [illegible] up a certain manufactory of the article, and expends a great deal of money in preparing to manufacture it, trusting to its being abandoned; would not it be very hard upon that party, if at the end of five years you were to get an extension of the patent for seven years, and so make all that machinery useless?

Sir Frederick Thesiger.—Your Lordship is putting a case which does not exist here. You must look to all the circumstances of each particular case. Your Lordships have a discretion to extend or not as you please. Each case must depend upon its own circumstances. I am putting before you the hard position in which the patentee stands here, with respect to those difficulties which have been thrown in his way of obtaining remuneration for that which he was entitled to. He has really had a very formidable adversary in the Government. With respect to the merchant service, the amount of user is such as not to encourage him till he has got justice done him by the Government, to seek to obtain satisfaction for the user by the merchant service; or if they failed to give him that, to proceed by action at law. It does appear to me that it is a very hard thing indeed here, when confessedly by the evidence of the witnesses and the admission of my Learned Friend, there has been a most beneficial public invention introduced by the patentee; and when he has been endeavouring to get remuneration for it from the Government, he should now find that the funds which ought to have been applicable to his claim, are passed over to other hands, to furnish the means by which he may be resisted; by which,

perhaps, a *scire facias* may be brought against him, even if your Lordships extend his patent in order to repeal that patent. My Lords, I should venture also to add to this, that we have been in communication with the engineers who have got the money from the Government for the purpose of arranging what we were to receive; we have never in the slightest degree abandoned our right to receive a portion of that money, such portion as we are entitled to.

Mr. Attorney-General.—Is not that a strong observation against my Learned Friend's application, that he is arranging with the engineers to receive a certain amount?

Sir Frederick Thesiger.—I do submit to your Lordships that there will be great hardship here upon the patentee if he be refused his extension under these circumstances. I know they are peculiar.

Lord Brougham.—What is the amount of the Government money?

Mr. Attorney-General.—At 2*l.* a horse, about 25,000*l.*

Lord Brougham.—Suppose you had gone against the merchant service for 6,000*l.*, and against the Government for 25,000*l.*, you would have received 31,000*l.*; that is a considerable sum.

Mr. Attorney-General.—9,000*l.* beyond their outlay. Their balance, they say, is 21,000*l.*

Sir Frederick Thesiger.—We have spent 26,000*l.*, and we owe 3,000*l.*

Lord Brougham.—That would be after all, then, a very small remuneration.

Judge of the Admiralty Court.—You have given no credit for the value of the vessel, the Archimedes.

Sir Frederick Thesiger.—The Archimedes was laid up in 1840, and never used again except in the experiment by Mr. Brunel. We have been encouraged to hope that we had proved sufficient to enable us to obtain an extension of the patent, subject to some conditions which, as I understood, my Learned Friend wished to have imposed upon us. I had not the slightest notion that my Learned Friend meant to oppose the extension of this patent till I heard him address your Lordships. I understood him really to admit that we had made out our case.

Mr. Attorney-General.—I quite admitted that it was unnecessary for my Learned Friend to multiply witnesses to prove the utility of this invention. But it has been in practice, now unresisted by the patentees, for five or six years. That is part of my case on behalf of the public.

Sir Frederick Thesiger.—You are not entitled to say "unresisted by the patentees." It has been resisted. The public have used it within the last few years, and we have been endeavouring within that time to get justice done us.

Mr. Attorney-General.—I submit that my Learned Friend has not furnished any answer to the observation which has been thrown out by your Lordships. Instead of insisting upon their right against the Government and against the public, that they have had no right, they have failed to substantiate the patent; they have lain by and allowed the public and the Government to incur considerable liabilities.

Lord Campbell.—Upon what day does the patent expire?

Mr. Attorney-General.—In May, 1850.

Lord Campbell.—Suppose a person, seeing that this invention was used without opposition, has built a ship, and has had a propeller constructed

upon that principle, as he might very well suppose he was not infringing the law, in this very year if he continues to use it he will be liable to an action, supposing we extend the patent.

Mr. Attorney-General.—Yes; he goes to an engineer and says, "May I have a screw?" The engineer says, "We have been making them for the last five years without complaint." The vessel accordingly is built, and in the middle of this year he is liable to an action. They have been bringing two actions against Mr. Lowe.

Mr. Webster.—There is an action which has been standing a long time in London.

Mr. Attorney-General.—That is not one of those cases; that is not the case of Mr. Smith's patent. The first object was to get rid of Mr. Lowe's. Then, when they find they cannot get rid of him, he comes into the combination, and an application is made for an extension.

Lord Campbell.—What evidence have you of any combination?

Mr. Attorney-General.—I will call the Secretary of the Company to prove that they have entered into an arrangement, and have offered to the Admiralty to sell their five patents. They have said, "At last we have got the parties to agree, and we will sell our five patents."

Sir Frederick Thesiger.—That was the proposal of the Admiralty to the patentees. I think it would be fairer to state that.

Mr. Attorney-General.—My Learned Friend is mistaken about that. Mr. Currey made a proposal to Mr. Robson, the Solicitor to the Admiralty. There is no doubt that there is that arrangement. Also, with respect to the number of merchant ships, I will prove the number of Government ships which have been fitted out since that time. So far as the Government is concerned, they have paid some sums; and if they were bound to pay at the rate of 2*l.* a horse, they would have to pay 25,000*l.* I apprehend, therefore, that is a strong ground for requiring that there should be something [illegible] with respect to the Admiralty and the public. The screw, whether it be Mr. Lowe's or Mr. Smith's, or a combination of four or five, taking the shaft from one and the deadwood from another, and the cut-screw from another, unquestionably is now in general use, and it is in contemplation with the Admiralty to fix them as auxiliary instruments to large vessels of war; and if your Lordships allow the patent to be extended, which is the subject of this combination, they will have the means of enforcing any terms they please.

Lord Campbell.—What conditions would you propose?

Mr. Attorney-General.—Not that they should have the extension in the terms of the patent, that the Admiralty should make the instruments, but that they should be allowed to employ engineers, not in their own yards, but engineers in the employ of the Government, without infringing the patent; that there should be a general license to the Government to make, or cause it to be made, for the purpose of the public service. Whether that will satisfy the right of the public is another question. The public, I think, are deeply interested, considering that these parties have laid by and have not enforced their rights.

Lord Campbell.—It does seem to be a most meritorious invention, and one from which the public will derive great benefit.

Mr. Attorney-General.—I do not deny that. This is the result of a combination not only of parties, but of the merits of inventions of differ-

ent parties; but it is a most important invention, and if they could all combine, so as to receive a reasonable reward without detriment to the public service, it is reasonable that they should do so.

Lord Campbell.—I see nothing immoral or reprehensible in those who have associated in the invention now saying, we will agree to share the remuneration.

Sir Frederick Thesiger.—It will prevent their tearing one another to pieces in useless litigation. My Learned Friend is aware that the Government have already called in Mr. Smith, the patentee, to assist them in bringing into use this screw propeller.

Mr. Webster.—The question has been between these parties as to the kind of propeller. Mr. Lowe has had one kind of propeller, and Mr. Erickson another, but they have all used the deadwood.

Lord Campbell.—When do the other patents expire?

Mr. Attorney-General.—Mr. Erickson's will expire in July; he has nothing but a cut-screw and an outrigger, which is perfectly useless. That is now in the paper for your Lordships' extension, Mr. Woodcroft's has been extended, Mr. Lowe's is a recent patent. There is now an application for Mr. Smith's. That is the state of things. I do not impute anything wrong to those gentlemen in agreeing together. It is a legal act, and within the condition of the patent, if they are all interested, provided their engagement is such that there will not be more than twelve of them interested in any patent; but it is a reason why your Lordships should take care that you should not create a monopoly against the public and the Government.

Sir Frederick Thesiger.—We are bound to furnish this patent invention at a fair price to the Admiralty, to be fixed by the Lords Commissioners of the Admiralty.

Mr. Attorney-General.—That does not enable the Government to make it by their engineers.

Sir Frederick Thesiger.—I have not the slightest objection to extend the right to the Admiralty's own engineers upon the same terms, the engineers in the private yards in fact.

Mr. Attorney-General.—I have communicated with the Admiralty, and I cannot accept the condition that a price shall be paid for the patent license for Government vessels. I apprehend the case is such that your Lordships would not extend it certainly as against the Government; you would allow it to be used free and unfettered by the Government, or by engineers employed by them.

Lord Campbell.—This being beneficial to the public, is not it one of those cases in which the original patent reserves the right of using it for the public advantage?

Sir Frederick Thesiger.—So it does; but I know of no case in which there has been reserved the right of using it for the public advantage without payment, and your Lordship sees in what a situation the patentee would be: he would have the exclusive right against the public individually, but not against the public collectively.

Lord Campbell.—He would not have the right against the State.

Mr. Attorney-General.—The Admiralty might by law make it in their own yard, if they had the machinery to make it. It is only because they want other engineers to do it. It is reasonable if the patentee is to furnish the implement that he should be paid, but if we make it by some other engineer employed by us, why should the patentee be paid? Then comes the question, which I am bound to submit in my position

as Attorney-General, what is the interest of the public? The more beneficial an invention is the more the public is entitled to consideration, if the patentee by his own neglect has not sought proper compensation, or if he has allowed parties to enter into engagements.

Sir Frederick Thesiger.—I have no objection to the Admiralty being at liberty to do in other yards what they can do in their own.

Mr. Attorney-General.—Let that be expressed in the renewal if it is to be granted.

Sir Frederick Thesiger.—Upon such payment as they may think reasonable.

Mr. Attorney-General.—Then you are throwing upon the Admiralty the odium of saying, they will pay nothing for the patent invention. If it is to be extended upon any terms the Admiralty should be at liberty to make it by any engineer, with full liberty to make or cause it to be made.

Sir Frederick Thesiger.—Those are very hard terms, which I am sure your Lordships would not impose upon us.

Lord Brougham.—What I thought a little while ago, which has not been quite satisfactorily disposed of by the answer from the Bar, applies to a party not now before us, except in so far as the Attorney-General represents the public. The patentee and the Admiralty, by the arrangements you are now discussing at the Bar, may be satisfied. The Admiralty may be satisfied and the patentee too, but that is merely a part of the public; and if there has been such a non-user or such a dormancy of the patent as there appears to have been, we must consider that.

Sir Frederick Thesiger.—The public have only been three years getting into the use of it.

Lord Brougham.—Mr. Smith is a very active man and an able man, of an indomitable spirit, as one of the [illegible] says, and yet all this time he has allowed 6,000*l.* for screw propellers to be taken from him by the 3,000 horse-power used in the merchant service, and has not done anything in the way of bringing actions against the parties.

Sir Frederick Thesiger.—Mr. Smith has really been in the employment of Government, superintending the making of these screws. Mr. Lowe claims the whole merits of his invention. Till Mr. Smith knows precisely what is to be the state of the matter, he cannot do anything effectively. He cannot force the payments which he may be entitled to, till it is ascertained whether his invention is the one which is ultimately entitled to the reward.

Mr. Attorney-General.—I do not think your Lordships will be influenced by the contest with Mr. Lowe. It may be that Mr. Smith has been assisting to try to upset Mr. Lowe's patent all this time, but the public are not to suffer for that. This is not the simple application of Mr. Smith. The Screw Propeller Company has taken it up, gentlemen of great capital and fortune, surely, they might have asserted their rights.

Sir Frederick Thesiger.—I have witnesses to show the circumstances under which this matter has stood over.

Lord Langdale.—I was desirous of knowing some time since, whether by the course which the case had taken at the Bar, you had been prevented from examining witnesses which it was your intention to examine.

Sir Frederick Thesiger.—I think I should have gone at much greater

length into my case, If I had not been induced to believe that I had done enough.

Lord Campbell.—You have done enough with respect to the novelty and utility.

Mr. Attorney-General.—I admit both the novelty and utility. I did not put a single question upon those points.

Lord Brougham.—I said, you are going on loading your points, and there has been no cross-examination. Then came another witness to go into the question of profit, and I said, that is quite another thing.

Lord Campbell.—Your accounts, I think, close in the year 1845?

Sir Frederick Thesiger.—Yes, my Lord. I propose to show that litigation has kept the thing in abeyance, and it is owing to that entirely.

Lord Brougham.—I do not quite think you have failed in your action against one party, because you could not prove the infringement is the least explanation why you did not proceed against the other, against whom you could have proved it.

Sir Frederick Thesiger.—We were preparing of course, and watching with the greatest interest the case of Lowe against Penn, the engineer, which was commenced in 1844, and which has been continued, and is now existing at the present moment.

Lord Brougham.—That is the case where there has been a new trial.

Sir Frederick Thesiger.—There have been two verdicts and a new trial, and the question is now pending whether there shall be another trial or not, and a *scire facias.* It is the state of litigation which has kept us from pressing our case.

Mr. Attorney-General.—Mr. Lowe has come into the bargain since that.

Lord Langdale.—Were you prepared to go into evidence of that kind?

Sir Frederick Thesiger.—N[illegible]s, my Lord. I must be candid with your Lordships. I really did not know that there would be any such point made till I heard the observation of my Learned Friend, the Attorney-General.

Mr. Attorney-General—I am quite willing to admit to the fullest extent the novelty and utility of the invention, but I do not think that those affect the question.

Lord Campbell.—I wish most earnestly that Mr. Smith could receive compensation.

Mr. Attorney-General.—I will prove now, if your Lordships please, by Mr. Robson, the use by the Admiralty in thirty-two vessels, and the offer to sell it to the Admiralty.

Mr. W. F. Robson was then examined (vide Minutes of Evidence.)

REPLY.

Sir Frederick Thesiger.—My Lords, I really think that we have been rather hardly dealt with in this case. My Learned Friend has put his defence or his opposition on the part of the public to the extension of this patent mainly upon the fact of there being a combination of a certain number—five or six different parties—who were entitled, under certain patents, to remuneration in respect of their inventions, and upon the hardship which would result to the public if your Lordships were to grant this extension to the present patentee, by reason of these parties combining together and compelling the public to pay, in respect of the

combination of the patents, what they would not have been bound to pay in respect of any one of those patents.

I apprehend, even if my Learned Friend had established that position, it would have been no answer whatever to this application, because the validity of each particular patent would remain precisely the same, whether the parties had combined or whether they remained each with their separate interests. If each patent were bad, all the patents combined could not make a good patent. Therefore my Learned Friend has really, as it appears to me, put this opposition first of all, upon a foundation which entirely fails in point of fact; and then even supposing he had materials for the purpose of establishing it, it would fail in point of fair application as a ground of opposition to the extension itself.

Just, my Lords, for one moment consider the situation in which we are placed in regard to that which is before you, because every case must depend upon its own peculiar circumstances. It is a matter for your Lordships' consideration. I cannot ask as a right to have this extension. I place the facts before you, and you are to judge whether there is not sufficient merit, and whether there has not been so little advantage derived from the meritorious invention as to induce your Lordships to think that in justice the party is entitled to the prayer of his petition.

My Lords, what are the facts? With regard to the invention itself they are overwhelming, as to the merit of it being entirely with Mr. Smith.

Lord Campbell.—We are all strongly of that opinion.

Sir Frederick Thesiger.—And as to the immense utility of the invention, what are the facts? With regard to the benefit which the party has derived from his invention, it is perfectly clear that although we bring our account only down to the year 1845, and, therefore, there is a period unexplained and to be accounted fo[illegible]what time: down at all events to 1845 we had not obtained any benefit, but had sustained a very considerable loss. So far we advanced down to the year 1845. I perfectly admit that if from that time a party having this beneficial invention had allowed the public to use it without any opposition on his part, and without any attempt whatever to obtain any remuneration from them, that would be a very strong ground for saying that he had waived his right for the benefit of the public, that he had, in fact, dedicated his invention to them, and therefore that he had no right, at the expiration of the period, or when his patent was nearly expiring, to apply for an extension. Are the circumstances of this case like that? Has this party (because that is the question) has this party so given up, abandoned, and dedicated his invention to the public, that it would be an injury to the public for him now to come, after a period of three or four years, and insist upon having a claim against the public by means of an extension?

In the first place, let us consider what was the position of the patentee in regard to the principal use of his invention. There is no doubt whatever that it was principally employed by the Government, and it was employed by the Government, having been manufactured, not only in their own yards but in the yards of private engineers and manufacturers. The public most unquestionably were the principal users of this invention. It is true it appears not very clearly from the evidence, but sufficiently so for the purpose of your Lordships' judgment, that various merchant-vessels have also been using this invention during that period to the extent, we will take it, of 3,000-horse power, making a claim which

Mr. Smith would be entitled to against them, supposing £2 per horse power is the proper remuneration, of £6,000. Has Mr. Smith, or those who represent him, by their conduct shewn that they have abandoned the right to remuneration in respect of this invention, which I apprehend to be the real question which is pressing upon your Lordships' minds.

Lord Campbell.—Allowing the unrestrained and unrestricted use of it.

Sir Frederick Thesiger.—Those are the terms which I object to, the unrestricted use of it. The parties could not prevent the fitting-up of vessels, both of the Government and of private individuals, with these screw-propellers. That is a thing they could not possibly prevent. But then it is said, but he ought to have insisted on his right in some way or other.

Lord Brougham.—Might not he have obtained an injunction against them for using it?

Sir Frederick Thesiger.—I think not. What was the state of the matter with regard to this question of screw-propellers?

Lord Brougham.—How many engineers upon the whole do you think made these 3,000-horse power screw-propellers?

Sir Frederick Thesiger.—I am afraid of answering, because I hear a different account given of it from those around me.

Lord Brougham.—If it was only one it would not have been worth your while, but if three persons made the 3,000-horse power screw-propellers, it would have been worth your while to have had an injunction against them. We know, generally, there is nothing so tedious as a Chancery suit, but there is this exception, that there is nothing so swift as an injunction.

Sir Frederick Thesiger.—But just consider what the state of this matter was in regard to the different inventions of different parties. We have gathered enough from the statement of the Attorney-General to come to the conclusion that there were various persons who pretended to have conflicting rights, each claiming priority, in this beneficial invention, and they were struggling with each other and watching each other. Of course if we had applied for an injunction against the engineers, that injunction would have been followed by the trial of an issue at law.

Lord Brougham.—Or they might have dissolved the injunction.

Sir Frederick Thesiger.—We do that without going into the Court of Chancery. We bring our action at law, and the result of that action is, that although we establish the validity of our patent——

Lord Brougham.—You brought the action against the wrong person.

Sir Frederick Thesiger.—We meant to bring it against the right. I am here not upon whether we have failed in our attempt, but what we have done by way of shewing that we have not given up to the public the right to the unrestrained use of this beneficial invention. Nobody would have been absurd enough to have brought his action against a party who had not been infringing, for the pleasure of failing and of paying £2,000 costs. We meant to bring our action against the right person.

Lord Campbell.—That was in 1844.

Sir Frederick Thesiger.—I am going to tell your Lordships what happened afterwards. Then there was a motion for a new trial. That hung up in the Court for a very considerable time, and then, my Lords, in the meantime here is Mr. Lowe's patent. He brings his action in the year 1844, and that litigation has been continuing from that time down to the the present. Now certainly there was nothing particularly inviting in the

circumstance of the trials which had taken place in the different Courts to induce the parties here till we saw our way, to go into a Court of Law against those persons who have been infringing our rights by making this patent article. The only ground upon which we failed was that we did not prove the circumstance how Steinman had placed these screw-propellers in the deadwood. What I want to get rid of is the notion that we have so entirely abandoned this right that the public would be entitled, at the present period, to say that we are coming here improperly against them for an extension of this patent.

What happened with respect to the Government, a formidable body, with whom we should have been principally in collision? In the first place, Mr. Smith was employed by them to superintend the construction of these screw-propellers in their public yards. In the next place, various engineers have been making from time to time different screw-propellers, the amount of which the Government themselves admit to be £2,500, at £2 per horse power. Now the question, who was entitled to that £2,500, was a question of very considerable difficulty, and one necessarily involving in its determination very considerable litigation between the parties, unless they could come to some arrangement upon the matter. And upon that state of things it was impossible to expect the Ship-propeller Company could with any effect urge upon the Government the propriety of their paying over to them the amount to which they were entitled to in respect of the screw-propeller, which they said had been used in Government vessels. They made application from time to time—the matter was never allowed to sleep—it was supposed that ultimately they would receive a proper remuneration for their invention, and it appears that the Government very fairly and properly suggested that there should be some sort of arrangement between these parties, by which they associating t[illegible] would be entitled to the sum of £25,000, which it was admitted [illegible] Government they were liable to pay in respect of these screw-prop[illegible] to by some equitable distribution among themselves. This is the [illegible] which I wish to draw your Lordships' attention. It seems to me that my Learned Friend is unfairly pressing the point against us.

Under these circumstances can your Lordships say that this case at all resembles the cases which have been suggested in regard to parties having an opportunity of enforcing remuneration from those who have infringed their invention, but who have not enforced it, but have lain by and seen it infringed year after year, and therefore may be taken to have waived any right which existed. It being perfectly clear here that the merit of this invention belongs to the patentee, it being perfectly clear that it is of great public utility; the question is this, no remuneration whatever being received up to this moment,—do your Lordships think he has not laid before you a fair case for an extension of his patent, by reason of those circumstances by which it is sought to be inferred that he has waived and abandoned the right, and given it entirely to the public?

I am afraid of trespassing upon your Lordships with any facts which are not distinctly before you, in respect to this sum of £25,000. It was quite clear that there was a fund held by the Government—that was a fund to which the party ultimately entitled would have recourse. There was no occasion for Mr. Smith to proceed against the Government. My Learned Friend says he would have had no action at all. However that may be, there he was with the hope and expectation that Government would do

justice to him in respect of his claim to a portion of the money which they had in their hands. That money has been given out now, and the question up to this moment is an undecided question—it is a question which may be said to have been in litigation from the year 1846, when the public first of all began to use the screw-propeller of Mr. Smith. Therefore, there is no pretence for saying that Mr. Smith has ever given up any right which he had, and he now claims under these circumstances your Lordships' judgment whether he is not entitled to an extension of time. I must confess it appears to me that it would be the hardest possible case, if Mr. Smith were turned away from your Lordships' Bar without obtaining what he humbly asks, and what he conceives, under the circumstances, he ought to obtain. It is a matter of course entirely for your Lordships' discretion, and I am sure that you will be desirous to do everything you could for a man so meritorious as Mr. Smith. I am quite satisfied that it will only be upon compulsion that your Lordships will come to the conclusion, that under the peculiar circumstances of this case Mr. Smith is not entitled to an extension of his patent.

The Counsel and parties were ordered to withdraw. After a short time they were again called in.

Lord Brougham.—Their Lordships have paid attention to the case from the great importance of the subject, and also because there are peculiarities in it which require investigation. It differs materially in one or two respects from the cases which have generally come before us. It requires that we should also attend to the peculiar circumstances of each case narrowly, because it is anything rather than to be taken as a matter of course, that when a party applies for an extension of a patent, merely on the ground that it is a valuable invention, he is to have an extension of it beyond the fourteen years which the Statute gives him. The parties will therefore perceive that it was necessary for us to examine minutely into the peculiarities of this case.

Their Lordships are of opinion that though there are certainly some peculiarities which are not [illegible] satisfactorily explained, especially the length of time during which no steps were taken to sue parties who were clearly infringing the patent, and the extension of time is not by way of compensation for such infringement to those who have the patent right, yet we have also to consider the circumstances in which the party was placed in respect to the Admiralty on the one hand, and to the great misadventure he had in steering through the Courts of Law, where he unfortunately went against the wrong parties, and at an expense of 2,000*l.* failed in his suit. We have to consider these matters all together, and also that we have no clear proof that there was any very great amount of infringement; because, though it is alleged on the one hand that there was one hundred merchant-vessels, that is a mere statement; and on the other hand, it is asserted there were 3,000-horse power, which also is a mere statement; possibly the truth may be between the two extremes.

Now while their Lordships do not think that, regard being had to other circumstances of this case, to the great merits of the patentee, which are undeniable, and to the great advantage likely to accrue to the public from this invention, enough has been made out for them to refuse this application; at the same time, in granting the extension, we are quite clear that it ought to be with a view to the condition exacted by the Attorney-General, and to which Sir Frederick Thesiger, on the part of his client, intimated that he had no objection. Such a condition

must be part of our recommendation to the Crown for the grant in question, but we cannot tell, it being very important that it should be accurately framed, how to word it, and, therefore, how to word our judgment. Accordingly we shall just state the amount of time for which we mean to extend our monopoly, adding, that before the close of the sittings, say within a few days, we wish that the parties should each give in that to which they have agreed; and then we, considering that with a favourable eye, will add and annex it to our recommendation, of the extension of which we are of opinion ought to be the term of five years.

Mr. Attorney-General.—Does your Lordship mean that my Learned Friend and myself, should agree as to the terms and conditions which we should mutually propose?

Lord Brougham.—Yes, we would rather have you agree to it.

Mr. Attorney-General.—I think in that there will be no great difficulty. I understand your Lordships to intimate that the Admiralty shall be at liberty to use it, and shall be at liberty to allow persons to make this screw for them without payment.

Sir Frederick Thesiger.—That seems the dividing point, whether it is to be upon the same terms as the original patent, or whether, as my Learned Friend contends, it is to be without payment.

Mr. Attorney-General.—Without payment, I contend—that is the point.

Lord Brougham.—You will settle that among yourselves.

Mr. Attorney-General.—The Court must settle that. We cannot agree to it. I cannot agree to their view, of course.

Lord Brougham.—You have a right to make it even standing the patent.

Mr. Attorney-General.—Yes, I propose that we shall have power to make or cause to be made and use it without payment.

Sir Frederick Thesiger.—My proposal is that we shall be required to furnish it upon such terms as the Commissioners of the Admiralty should direct, and I propose to extend the clause to private yards.

Mr. Attorney-General.—If you furnished it upon such terms, we should have to fix the price of the instrument. Of course, if we were making it ourselves we should fix nothing.

Lord Brougham.—Regard being had to the length of time you have allowed this to go on, do you think, Sir Frederick Thesiger, it is unfair to require that no action should now be brought for anything that has passed within the last six years? You cannot go beyond six years, of course. I merely put it to you.

Sir Frederick Thesiger.—They have all had notice, my Lord, every one of them. I leave it to your Lordships' judgment, but it seems to me to be a restriction which, under the circumstances, probably, your Lordships would not think we ought to agree to.

Lord Brougham.—The condition in question is between you and the Admiralty. I am speaking now for Mr. Attorney-General's other clients, the public.

Mr. Attorney-General.—Will your Lordships settle whether we are to pay or not. We shall never agree upon that.

Sir Frederick Thesiger.—If your Lordships will look at the terms of the original patent.

Mr. Attorney-General.—The article we want is a compound article.

To call upon them to make an entire screw similar to that in the patent, would be no good to us.

Sir Frederick Thesiger.—It will only be what they themselves think fair.

Mr. Attorney-General.—That is an invidious position to be placed in.

Lord Brougham.—I think that is putting them in a very odious light.

Sir Frederick Thesiger.—I am only taking the original patent.

Lord Brougham.—I think it must be without any payment at all. They reserve the right during the patent always.

Sir Frederick Thesiger.—They always pay for it. There is not a single instance in which the Government have used a patent invention in which they have not paid for it. This will be the first time in which it has been done.

Mr. Attorney-General.—If the patentee supplies the article, they pay for it, not otherwise.

Lord Brougham.—Do you mean to say, that that restriction which is inserted in every patent, reserving to Her Majesty the right to use the same, means nothing? If you make an article for the patentee, and supply it, the Government pay you, but suppose the Government employ their own men, they do not pay you?

Sir Frederick Thesiger.—Yes, my Lord, they do. Here are the terms, which speak for themselves. Here is the form of the patent. "And also, if the said A. B., his executors, administrators, or assigns, shall not supply, or cause to be supplied, for our service, all such articles of the said invention," and so on, "which he shall be required to supply, in such manner, at such times, and at, and upon, such reasonable prices and terms as shall be settled for that purpose by the Master-General of our Ordnance," and so on, then that the letters patent shall be void.

Lord Brougham.—I thought there had been another reservation.

Mr. Attorney-General.—That is the effect of the law.

Sir Frederick Thesiger.—There is no instance in which a patent invention has been used by the Government, without its being paid for.

Mr. Attorney-General.—The Crown may make it, and use it, so long as it confines the manufacture to its own officers. If it employs another engineer to make it, the engineer is guilty of a violation. I want permission to employ an engineer to make this instrument. I apprehend we ought not to pay the engineer or the patentee for his license, or we get nothing.

Sir Frederick Thesiger.—In this case they have paid their 2*l.* per horse-power, showing that they felt they were bound to pay for it.

Mr. Attorney-General.—Conceive the effect of it. It will prevent our using it as an auxiliary power to our vessels, or we must be paying an enormous sum. We are putting it to every vessel.

Lord Brougham.—You will pay what is fair and reasonable; and, on the other hand, if you are to do whatever you please, in spite of the letters patent, these five years will apply only to the use in the merchant service.

Mr. Attorney-General.—I thought your Lordships had granted the terms I ask for. It cannot be left to us to say what we shall pay, because we shall pay nothing; and you cannot put the Admiralty in that invidious position.

Sir Frederick Thesiger.—What I propose is, to extend the original condition in the letters patent, with a view to private yards.

Mr. Attorney-General.—We shall be in this difficulty. We do not want the patent article. If we were to call upon them to supply that, they would give it to us with a turn and a half: we do not want that. It will do us no good, for us to call upon him to supply his patent article. We use a portion of it, the deadwood, and we use the cut screw of Mr. Lowe.

Lord Brougham.—You may imagine a very useful invention, in which the Government would be the sole users.

Mr. Attorney-General.—It is a matter of the deepest importance to the Admiralty and the country.

Sir Frederick Thesiger.—I trust your Lordships will not require us to supply it without payment.

Lord Campbell.—You are getting a favour, you must remember, Sir Frederick.

Lord Brougham.—We are never to forget in what capacity we sit here. The Act of 1835 put us into the place of Parliament. Would Parliament ever have passed an Act of this sort, the Crown being a party to it, the Ministers' consent being asked before it could pass through either House? Would Parliament ever have granted an extension of the patent without some such provision as this? I think there can be no doubt about it. Therefore, there will be no payment. We have laid down the rule, and you will work it out among yourselves.

Lord Brougham.—This does not touch the right to the amount of 25,000*l.*

Sir Frederick Thesiger.—No; but your Lordships have given the right now to the private engineers, who will get all the profit, while the patentee gets none. May I ask your Lordships to whom the extension is to be granted.

Lord Brougham.—We never stated that.

Sir Frederick Thesiger.—Your Lordships will see that in the patent there is a stipulation that it shall not be assigned to more than twelve persons. That is got rid of by means of the Act establishing "The Ship Propeller Company"—that will not apply to the extension. Will your Lordships allow the extension without that stipulation?

Lord Brougham.—We never interfere with that—we grant it to the parties who are entitled by law.

Lord Campbell.—To whom do you pray that the extension may be?

Sir Frederick Thesiger.—I think the best way will be to omit that stipulation.

Lord Campbell.—We cannot direct that. Is there any other mode which you can suggest?

Sir Frederick Thesiger.—There is some difficulty about it, because it cannot even be held in trust.

Lord Campbell.—I doubt the power of this Board to do it.

Sir Frederick Thesiger.—There will be great difficulty about it. We must consider it, however.

LIST OF IRISH PATENTS.

From October 30, to November 13, 1850.

Maxwell Miller, of Glasgow, in the County of Lanark, Coppersmith, for Improvements in distilling and rectifying.—Sealed October 30, 1850.

Charles Bury, of Salford, in the county of Lancaster, Manager, for Certain improvements in machinery or apparatus for cleaning, spinning, doubling, and throwing raw silk.—Sealed November 4, 1850.

Antoine Panwells, of Paris, France, Merchant, and Vincent Dubochet, of Paris, France, for Certain improvements in the production of coke, and of gas for illumination, and also for regulating the circulation of such gas.—Sealed November 11, 1850.

William Palmer, of Sutton-street, Clerkenwell, Manufacturer, for Improvements in the manufacture of candles and wicks.—Sealed November 11, 1850.

Robert Lucas, of Furnival's Inn, London, Mechanical Draughtsman, for Improvements in telegraphic and printing apparatus.—Sealed November, 11, 1850.

Etienne Joseph Hanon Valcke, of the Kingdom of Belgium, Miller, for Improvements in Grinding.—Sealed November 13, 1850.

LIST OF SCOTCH PATENTS.

From October 25 to November 22, 1850.

Etienne Masson, of Place St. Michel, Paris, Gardener to the Central Society of Horticulture of France, for Improvements in the preparation of certain vegetable alimentary substances, for the provisioning of ships and armies, and other purposes where the said substances are required.—Sealed October 25, 1850.—(*Six months.*)

Zacariah Morley, of [illegible] Park, in the county of Middlesex, Esq., for Certain improvemen[illegible] means or methods of, or apparatus or machinery for, decomposi[illegible], and applying the products to useful purposes.—Sealed Octo[illegible]er [illegible]8, [illegible]850.—(*Six months.*)—(Communication.)

Robert Lucas, of Furnival's Inn, in the county of Middlesex, Mechanical Draughtsman, for Improvements in telegraphic and printing apparatus.—Sealed October 31, 1850.—(*Six months.*)—(Communication.)

George Michels, of London, Gentleman, for Improvements in treating coal, and in the manufacture of gas, and also in apparatus for burning gas.—Sealed November 5, 1850.—(*Six months.*)

William Henry Ritchie, of Kennington, in the county of Surrey, Gentleman, for Improvements in stoves.—Sealed November 6, 1850.—(*Six months.*)

Peter Spence, of Pendleton, Manchester, Manufacturing Chemist, for Improvements in the manufacture of alum, and certain alkaline salts, and in the manufacture of cement, part of which improvements are applicable in obtaining volatile liquids.—Sealed November 7, 1850.—(*Six months.*)

Alfred George Anderson, of Great Suffolk-street, in the county of Surrey, Soap Manufacturer, for Improvements in the treatment of a substance produced in soap making, and its application to useful purposes.—Sealed November 7, 1850.—(*Four months.*)

John M'Nicoll, of Liverpool, in the county of Lancaster, Engineer,

for Improvements in machinery for raising and conveying weights.—Sealed November 7, 1850.—(*Six months.*)

John Lienau, Junior, of Wharf-road, City-road, in the county of Middlesex, Merchant, for Improvements in purifying or filtering oils, and other liquids.—Sealed November 7, 1850.—(*Six months.*)

John Tatham, and David Cheetham, of Rochdale, in the county of Lancaster, Machine Makers, for Certain improvements in the manufacture of cotton, and other fibrous materials, and fabrics composed of such materials.—Sealed November 7, 1850.—(*Six months.*)

Hugh Mair, of Ingram-street, in the city of Glasgow, North Britain, Manufacturer, for Improvements in certain classes of figured muslins, and in the machinery or apparatus employed in the manufacture or production thereof, which improvements, or parts, are applicable to harness weaving generally.—Sealed November 11, 1850.—(*Four months.*)

George Hurwood, of Ipswich, in the county of Suffolk, Engineer, for Improvements in grinding corn, and other substances.—Sealed November 11, 1850.—(*Six months.*)

Rodolph Helbronner, of Regent-street, in the county of Middlesex, for Improvements in preventing the external air, and dust and noise, from entering apartments.—Sealed November 11, 1850.—(*Four months.*)

Evan Protheroe, of Austin-friars, in the city of London, Merchant, for Improvements in the manufacture of oxide of zinc, and in making paints from oxide of zinc.—Sealed November 11, 1850.—(*Six months.*)

James Samuel, of Willoughby House, in the county of Middlesex, Civil Engineer, for Certain improvements in the construction of railways and steam engines, and in steam engine machinery.—Sealed November 12, 1850.—(*Six months.*)

Theodore Cartali, of Manchester, in the county of Lancaster, Merchant, for Certain improvements in the treatment or preparation of yarns or threads, for weaving, and in the manufacture of certain woven fabrics.—Sealed November 13, 1850.—(*Six months.*)—(Communication.)

John Clare, Junior, of Exchange-buildings, Liverpool, Gentleman, for Improvements in the manufacture of metallic casks.—Sealed November 13, 1850.—(*Six months.*)

Charles Bury, of Salford, in the county of Lancaster, Manager, for Certain improvements in machinery, or apparatus for preparing and spinning, doubling or twisting silk waste, cotton, wool, flax, or other fibrous substances.—Sealed November 13, 1850.—(*Six months.*)

Richard Clyburn, Engineer to the firm of D. Maclean and Son, of St. George-street East, in the county of Middlesex, for Improvements in wheel carriages.—Sealed November 14, 1850.—(*Six months.*)—(Communication.)

John Tucker, of the Royal Dock-yard, Woolwich, in the county of Kent, Shipwright, for Improvements in steam-boilers, and in gearing, cleansing, and propelling vessels.—Sealed November 15, 1850.—(*Six months.*)—(Communication.)

John Robert Johnson, of Crawford-street, in the county of Middlesex, Chemist, for Improvements in fixing colours on fabrics made of cotton or other fibre.—Sealed November 15, 1850.—(*Six months.*)

Clement Augustus Kurtz, of Manchester, in the county of Lancaster, Practical Chemist, for Improvements in dyeing.—Sealed November 15, 1850.—(*Six months.*)

Antoine Panwells, of Paris, France, Merchant, and Vincent Dubochet, also of Paris, France, Merchant, for Certain improvements

in the production of coke, and of gas for illumination, and also in the regulating the circulation of such gas.—Sealed November 18, 1850.—(*Six months.*)

ROBERT COTGRAVE, of Eccleston, in the county of Chester, Farmer, for Certain improvements in machinery or apparatus for draining and cultivating land.—Sealed November 19, 1850.—(*Six months.*)

JOHN HAMILTON, of Prince's-square, Glasgow, and JOHN WEEMS, of Johnstone, in the Kingdom of Scotland, for Improvements in warming and ventilating buildings and structures.—Sealed November 20, 1850.—(*Six months.*)

JOHN TURNER, of Birmingham, in the county of Warwick, Engineer, and JOSEPH HARDWICK, of Birmingham aforesaid, Builder, for Certain improvements in the construction and setting of steam boilers.—Sealed November 20, 1850.—(*Four months.*)

ALEXANDER MEIN, Accountant in Glasgow, Communication from the late James Smith, of Deanston, North Britain, for Certain improvements in treating the fleeces of sheep when on the animals.—Sealed November 20, 1850.—(*Six months.*)

WILLIAM and COLIN MATHER, of Salford, Engineers, and FERDINAND KASELOWSKY, of Berlin, in the Kingdom of Prussia, Engineer, for Improvements in machinery for washing, steaming, drying, and finishing cotton, linen, and woollen fabrics.—Sealed November 21, 1850.—(*Six months.*)

EDWIN PETTITT, of Birmingham, in the county of Warwick, Civil Engineer, for Improvements in the manufacture of Glass, and in the method of forming or shaping and ornamenting vessels and articles of glass, and in the construction of furnaces and annealing kilns.—Sealed November 22, 1850.—(*Six months.*)

JOHN MATTHEWS, of Kidderminster, Foreman, for Improvements in sizeing paper.—Sealed Novem[illegible] 1850.—(*Six months.*)

WILLIAM RADLEY, Chemical Engineer, and FREDERICK MEYER, Oil Merchant, both of Lambeth, in the county of Surrey, for Improvements in treating fatty, oleaginous, resinous, bituminous, and cerous bodies, the manufacture and application of them, and of their compounds and subsidiary products, together with the apparatus to be employed therein, to new and other useful purposes.—Sealed November 22, 1850.—(*Six months.*)

LIST OF ENGLISH PATENTS.

From November 2, to November 30, 1850.

MATTHEW HODGKINSON, of Red-street, near Newcastle-under-Lyne, in the county of Stafford, Mine Agent, for Improvements in furnaces or apparatus for smelting ores and minerals, and for the making of pig iron.—Sealed November 2, 1850.—(*Six months.*)

VICTOR EMILE WARMONT, of Neuilly, Seine, in the Republic of France, for Improvements in dyeing wool, and other fibrous materials and fabrics.—Sealed November 2, 1850.—(*Six months.*)

JOSEPH CHRISTIAN DAVIDSON, of Yalding, in the county of Kent, Brickmaker, for Improvements in lime and other kilns and furnaces.—Sealed November 2, 1850.—(*Six months.*)

JOHN MATTHEWS, of Kidderminster, Foreman, for Improvements in sizeing paper.—Sealed November 2, 1850.—(*Six months.*)

Jonas Bateman, of Upper-street, Islington, in the county of Middlesex, Cooper, for Improvements in life-boats.—Sealed November 2, 1850. —(*Six months.*)

Archibald Slate, of Woodside Iron-works, Dudley, for Improvements in canal navigation.—Sealed November 2, 1850.—(*Six months.*)

Pierre Antoine Auguste de la Barre de Nanteuil, of Leicester-street, in the county of Middlesex, for Improvements in propelling carriages.—Sealed November 2, 1850.—(*Six months.*)—(Communication.)

William and Colin Mather, of Salford, Engineers, and Ferdinand Kaselowsky, of Berlin, in the Kingdom of Prussia, Engineer, for Improvements in machinery for washing, steaming, drying, and finishing cotton, linen, and woollen fabrics.—Sealed November 2, 1850.—(*Six months.*)

John Borland, of Norfolk-street, Strand, in the county of Middlesex, Engineer, for Certain improvements in weaving machinery.—Sealed November 2, 1850.—(*Six months.*)

John Slate, of Wandsworth, in the county of Surrey, Accountant, for Improvements in stoves and furnaces, and in chimney-pots and regulators.—Sealed November 2, 1850.—(*Six months.*)

John Tatham and David Cheetham, of Rochdale, in the county of Lancaster, Machine Makers, for Certain improvements in the manufacture of cotton and other fibrous materials and fabrics composed of such materials.—Sealed November 2, 1850.—(*Six months.*)

Richard Clyburn, Engineer to the firm of D. Maclean and Son, of St. George-street East, in the county of Middlesex, for Improvements in wheel carriages.—Sealed November 2, 1850.—(*Six months.*)—(Communication.)

James Black, of Edinburgh, Machine Maker, for A machine for folding.—Sealed November 7, 1850.—(*Six months.*)—(Communication.)

Richard Archibald Brooman, of [illegible]-street, in the city of London, for Improvements in railways.—Sealed November 7, 1850.—(*Six months.*) —(Communication.)

William Fairbairn, of Manchester, Civil Engineer, for Improvements in cranes and other lifting or hoisting machines.—(Sealed November 7, 1850.—(*Six months.*)

William Crane Wilkins, of Long-acre, in the county of Middlesex, Engineer, for An invention for lighting, and in apparatus for lighthouses, signal, floating and harbour lights.—Sealed November 7, 1850.—(*Six months.*)

Samuel Edwards, James Ansedi, and Patrick Heyns, of Shadwell, in the county of Middlesex, Engineers, for Certain improvements in obtaining and applying motive power, and in pumps.—Sealed November 7, 1850.—(*Six months.*)

George Frederick Morrell, of Fleet-street, London, Gentleman, for Improvements in obtaining and applying motive power, and also in pumps.—Sealed November 7, 1850.—(*Six months.*)

John Alexander Lerow, of Boston, in the United States of America, Gentleman, for Certain improvements in sewing machines.—Sealed November 7, 1850.—(*Six months.*)

Benjamin Guy Babington, of George-street, Hanover-square, in the county of Middlesex, Doctor of Medicine, for Improvements in preventing incrustation of steam and other boilers.—Sealed November 7, 1850. —(*Six months.*)

John Clare, junior, of Exchange-buildings, Liverpool, Gentleman,

for Improvements in the manufacture of metallic casks.—Sealed November 7, 1850.—(*Six months.*)

JOHN ROBINSON, of Stepney, in the county of Middlesex, Engineer, for Improvements in lifting and moving fluid and other bodies, and in apparatus for steering ships and other vessels.—Sealed November 7, 1850.—(*Six months.*)

DAVID CHRISTIE, of St. John's-place, Broughton, in the county of Lancaster, Merchant, for Improvements in machinery or apparatus for preparing, carding, spinning, doubling, twisting, weaving, and knitting cotton, wool, and other fibrous substances; also for sewing and packing.—Sealed November 7, 1850.—(*Six months.*)—(Communication.)

ROBERT LUCAS, of Furnival's Inn, in the city of London, Mechanical Draughtsman, for Improvements in telegraphic and printing apparatus.—Sealed November 7, 1850.—(*Six months.*)—(Communication.)

THOMAS MAIN, of the Strand, in the county of Middlesex, Printer, for Improvements in printing machinery.—Sealed November 8, 1850.—(*Six months.*)

JAMES ROCK, junior, of Hastings, in the county of Sussex, Coachbuilder, for Certain improvements in carriages, which are also applicable in whole or in part to other machines.—Sealed November 9, 1850.—(*Six months.*)

WILLIAM PALMER, of Sutton-street, Clerkenwell, in the county of Middlesex, Manufacturer, for Improvements in the manufacture of candles and night-lights.—Sealed November 9, 1850.—(*Six months.*)

JAMES SCOTT, of Falkirk, North Britain, Shipwright, for Certain improvements in docks, ships, and apparatus connected therewith.—Sealed November 9, 1850.—(*Six months.*)

SIR FRANCIS CHARLES KNOWLES, of Lovell, in the county of Bucks, Bart., for Improvements in the m[illegible]ufacture of charcoal.—Sealed November 9, 1850.—(*Six mont[illegible]*)

LUCIEN VIDIE, of 14, Rue [illegible] and Chantier, Paris, French Advocate, for Improvements in me[illegible] the pressure of air, steam, gas, and liquids.—Sealed November 9, 185[illegible].—(*Six months.*)

JOSEPH NYE, of Mill-pond Wharf, Park-road, Old Kent-road, Engineer, for Improvements in hydraulic machinery; parts of which improvements are applicable to steam-engines and machinery for driving piles.—Sealed November 12, 1850.—(*Six months.*)

GEORGE ROBINS BOOTH, of London, Engineer, for Improvements in the manufacture of gas.—Sealed November 12, 1850.—(*Six months.*)

PETER SPENCE, of Pendleton, Manchester, Manufacturing Chemist, for Improvements in the manufacture of alum and certain alkaline salts, and in the manufacture of cement; part of which improvements are applicable in obtaining volatile liquids.—Sealed November 12, 1850.—(*Six months.*)

EDWIN CLARK, of Palace, New-road, in the county of Middlesex, Civil Engineer, and HENRY MAPPLE, of Child's-hill, Hampstead, Electric Engineer, for Improvements in electric telegraphs, and in apparatus connected therewith.—Sealed November 12, 1850.—(*Six months.*)

HENRY MEDHURST, Engineer, in the employ of Messrs. Shears and Sons, of Bankside, Southwark, for Improvements in gas-meters.—Sealed November 12, 1850.—(*Six months.*)

ETIENNE MASSON, of Place St. Michel, Paris, Gardener to the Central Society of Horticulture of France, for Improvements in the preparation of certain vegetable alimentary substances for the provi-

sioning of ships and armies, and other purposes where the said substances are required to be preserved.—Sealed November 12.—(*Six months.*)

JOHN BALL, of Ashford, in the county of Kent, Engineer, for Improvements in applying heat to bakers' ovens and their appendages.—Sealed November 12, 1850.—(*Six months.*)

HENRY WIMSHURST, of Limehouse, in the county of Middlesex, Ship-builder, for Improvements in steam-engines, in propelling, and in the construction of ships and vessels.—Sealed November 12, 1850.—(*Six months.*)

CHARLES MARSDEN, of Kingsland-road, in the county of Middlesex, Engineer, for Improvements in scissors and in thimbles.—Sealed November 12, 1850.—(*Six months.*)

JOHN SWINDELLS, of the firm of Swindells and Williams, of Manchester and Ince, near Wigan, Manufacturing Chemist, for Certain Improvements in obtaining products from ores and other matters containing metals; and in the preparation and application of several such products for the purpose of bleaching, printing, dyeing, and colour making.—Sealed November 14, 1850.—(*Six months.*)

ROBERT HOWARTH, of Chapman-street, Oldham-road, Manchester, for Improvements in machinery for raising a nap on cotton, woollen, silk, and other fabrics.—Sealed November 14, 1850.—(*Six months.*)

JOSEPH CONRAD BARON LIEBHABER, of Paris, for Improvements in blasting rocks; also in working marble and stone, and in preparing products therefrom.—Sealed November 14, 1850.—(*Six months.*)

EDWARD DAVID ASHE, of Brompton, in the county of Middlesex, Lieutenant in Her Majesty's Navy, for A new or improved nautical instrument, or instruments applicable especially, amongst other purposes, to those of great circle sai[illegible]ealed November 14, 1850.—(*Six months.*)

WILLIAM DUCKWORTH, of Liver[illegible] Coffee Merchant, for Certain improvements in the manufacture [illegible]y, with certain improvements in the machinery or apparatus for the manufacture thereof.—Sealed November 14, 1850.—(*Six months.*)

CHARLES ALLEMAND, of Paris, Gentleman, for An improved apparatus for producing light.—Sealed November 14, 1850.—(*Six months.*)

THOMAS SHORE, of Exwich, in the parish of St. Thomas the Apostle, in the county of Devon, Miller, for An improved method of dressing flour.—Sealed November 14, 1850.—(*Six months.*)

ABRAHAM HALLY, of Frome, in the county of Somerset, Machinist, for Certain improvements in looms for weaving.—Sealed November 14, 1850.—(*Six months.*)

THOMAS COATS, of Ferguslie, in the town of Paisley, and county of Renfrew, Scotland, Thread Manufacturer, for Certain improvements in turning, cutting, and shaping wood and other materials.—Sealed November 16, 1850.—(*Six months.*)

JOSEPH MARTIN, of Liverpool, Rice Miller, for Improvements in machinery and apparatus for cleansing and otherwise treating rice, and certain other grains, seeds, and farinaceous substances.—Sealed November 16, 1850.—(*Six months.*)

THOMAS ALLAN, of St. Andrew's-square, Edinburgh, for Certain improvements in electric telegraphs, and in the application of electric currents for deflecting magnets, or producing electro-magnets.—Sealed November 16, 1850.—(*Six months.*)

William Laird, of Liverpool, in the county of Lancaster, Merchant, and Edward Alfred Cowper, of Handsworth, in the county of Warwick, Engineer, for Improvements in machinery for loading and discharging certain descriptions of cargo in ships and other vessels, and in the construction of such vessels.—Sealed November 19, 1850.—(*Six months.*)

John Hosking, of Islington, in the county of Middlesex, Engineer, for Certain improvements in valves applicable to pumps; and also in apparatus to regulate the pressure and flow of water or air in and through pipes.—Sealed November 19, 1850.—(*Six months.*)

Thomas Dunn, of Windsor-bridge Iron Works, Pendleton, near Manchester, in the county of Lancaster, Engineer, for Improvements in the machinery and apparatus for moving engines and carriages from one line of rails to another, and for turning them; also for compressing certain substances, and for raising and lowering heavy bodies.—Sealed November 19, 1850.—(*Six months.*)

Paul de Folstoy, of Paris, in the State of France, General in the Service of His Majesty the Emperor of Russia, for Improvements in dredging machines.—Sealed November 19, 1850.—(*Six months.*)—(Communication.)

Clement Augustus Kurtz, of Manchester, in the county of Lancaster, Practical Chemist, for Improvements in dyeing.—Sealed November 19, 1850.—(*Six months.*)—(Communication.)

Alfred Vincent Newton, of Chancery-lane, in the county of Middlesex, Mechanical Draughtsman, for An improved composition applicable to the coating of wood, metals, plaster, and other substances, which are required to be preserved from decay; which composition may be employed as a pigment or paint.—Sealed November 19, 1850.—(*Six months.*)—(Communication.)

Robert Brown, of Liverpool, in the county of Lancaster, Plumber and Brass-Founder, for Improvements in, and the application of, pumps for raising or forcing water.—Sealed November 19, 1850.—(*Six months.*)

Henry William Ripley, of Bradford, in the county of York, Dyer, for Improvements in dressing and finishing piece-goods.—Sealed November 19, 1850.—(*Six months.*)

John James Greenough, of the Strand, in the county of Middlesex, Gentleman, for Improvements in the construction of chairs, couches, and seats; parts of which improvements are also applicable to various purposes, where springs for supporting heavy bodies and resisting sudden and continuous pressure are required.—Sealed November 21, 1850.—(*Six months.*)—(Communication.)

James Bendall, of Woodbridge, in the county of Suffolk, Machinist, for Improvements in certain agricultural implements.—Sealed November 23, 1850.—(*Six months.*)

George Shepherd, of Holborn-bars, in the city of London, Civil Engineer, and Charles Button, of the same place, Operative Chemist, for Certain improvements in the means or appliances used in conveying telegraphic intelligence between different places.—Sealed November 23, 1850.—(*Six months.*)

Christopher Nickels, of York-road, Lambeth, in the county of Surrey, Gentleman, for Improvements in the manufacture of woollen and other fabrics.—Sealed November 23, 1850.—(*Six months.*)

John Hamilton, of Prince's-square, Glasgow, and John Weems, of Johnstone, in the Kingdom of Scotland, for Improvements in warming

and ventilating buildings and structures.—Sealed November 25, 1850. —(*Six months.*)

Robert Olddiss Bancks, of the firm of Bancks Brothers, of Wierhouse Mill, Chesham, in the county of Bucks, and 20, Piccadilly, London, Paper-makers and Card-makers, for Improvements in the manufacture of paper.—Sealed November 30, 1850.—(*Six months.*)

Francis Frederick Woods, of Pelham-terrace, Brompton, in the county of Middlesex, Builder, for Improvements in paving.—Sealed November 30, 1850.—(*Six months.*)

John Ainslie, late of Alperton, in the county of Middlesex, now residing at Perry-hill, Sydenham, in the county of Kent, Draining Engineer, for Certain arrangements and apparatus for the manufacture of bricks, tiles, and other articles made from clay and other plastic substances; part of the said arrangements and apparatus being applicable to the treatment and preparation of earths, minerals, animal, and vegetable matters.—Sealed November 30, 1850.—(*Six months.*)

James Augustus Elmslie and George Simpson, of Union-buildings, Leather-lane, in the parish of St. Andrew's, Holborn, and county of Middlesex, Importers of Quicksilver, and Tin Foil Manufacturers, for Improvements in sheathing ships, and in protecting and confining gunpowder and certain compounds thereof, and in the materials used for such purposes.—Sealed November 30, 1850.—(*Six months.*)

Henry Potter Burt, of the Blackfriars-road, in the county of Surrey, Civil Engineer, for Improvements in the manufacture of window-blinds.—Sealed November 30, 1850.—(*Six months.*)

William Henry Ritchie, of Kennington, in the county of Surrey, Gentleman, for Improvements in stoves.—Sealed November 30, 1850. —(*Six months.*)

Joseph Eugene Chabert, of Paris, in the Republic of France, for Improvements in machinery for washing and dyeing linen and other fabrics.—Sealed November 30, 1850.—(*Six months.*)

Richard Barber, of Hotel-street, Leicester, late Cotton-winder, for Improvements in the manufacture of reels for reeling, and stands for reels; which improvements are applicable to the manufacture of desk or wafer seals.—Sealed November 30, 1850.—(*Six months.*)

Henry Jules Borie, of Boulevard Poissoniere, in the Republic of France, Engineer, for Improvements in the manufacture of bricks.—Sealed November 30, 1850.—(*Six months.*)

Charles Rowley, of Birmingham, Manufacturer, for Improvements in the manufacture of dress-pins and other dress fastenings and ornaments.—Sealed November 30, 1850.—(*Six months.*)

Richard Blakemore, of the Leys, in the parish of Ganerew, in the county of Hereford, Esquire, M.P., for Improvements in the construction of ploughs.—Sealed November 30, 1850.—(*Six months.*)

Frederick Buonapart Anderson, of Gravesend, in the county of Kent, Optician, for Certain improvements in spectacles.—Sealed November 30, 1850.—(*Six months.*)

Henry Duncan Preston Cunningham, of Bury, in the county of Hants, Paymaster and Purser in the Royal Navy, for Improvements in reefing sails.—Sealed November 30, 1850.—(*Six months.*)

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WITH A

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AND OF THE POINTS DECIDED.

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A.		
Abbott *v.* Williams et als.	381	9 Rep. Arts, 4th S., 103
———————	383	
This patent was originally granted to the defendant, Mr. Williams, and assigned to the plaintiff. The invention consisted of causing hair, or other fibres, separate or mixed, to be spread out in an even manner on to a travelling endless surface of wire-cloth, such endless cloth, with the fibres spread thereon, meeting with a second endless cloth in such manner, that the layer of fibre became enclosed between the two endless wire-cloths, and in this state the fibres were passed into and impregnated with melted pitch, tar, or other cement; the fibres so between the wire-cloths were then pressed between pressing-rollers, and the excess of adhesive matter was expressed therefrom. By these means the fibres were made into a continuous sheet, and capable of being used for the sheathing of ships, and a variety of other purposes, for which felt had been previously used. The defendant took out another patent, and proceeded to work thereon. The process consisted of throwing fibres into a chamber, in one part of which there was a cylinder covered with wire-cloth, and from which the air was withdrawn, to produce a partial vacuum,—so that the fibres, by the rush of air to and through the cylinder, were carried against the surface of the cylinder, a		

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Names of Cases.	Reported Page.	Where reported in other works.
larger or less thickness of fibre being obtained, according as the cylinder rotated slowly or more quickly. The fibre was constantly being removed from the cylinder as part of its surface passed out of the chamber, so that there was constantly an accumulation of fibre on one part of the cylinder, coupled with the removal of the sheet of fibre from another part of the cylinder. The sheet of fibre thus obtained was then passed through between pressing-rollers, there being adhesive matter applied above and below. The plaintiff filed his bill to obtain an injunction to restrain the defendants, and an injunction was granted *exparte*. Application was made to dissolve the injunction on the grounds, that there was no infringement, that the plaintiff had kept back an important fact, no mention having been made in the bill of the defendant having a second patent, and that the first patent was bad in law. His Honour held, that the long standing of the patent justified him in assuming that it was valid. That the second patent having been taken for making artificial leather, vellum, and parchment, the plaintiff was not to be expected to know that that patent was intended to make sheathing or felt, and therefore the plaintiff could not be required to mention such a matter in his bill, seeing that he came to the Court to ask that the defendants should be restrained from making sheathing for ships. His Honour assuming the patent good, considered there had been an infringement; the same manufacture had been produced, the means of getting a continuous sheet of fibre, and the mode of applying the adhesive matters, had been varied by defendants from those practised under the patent assigned to the plaintiff. His Honour continued the injunction so far as it restrained the defendants making ships' sheathing under the second patent, but dissolved it so far as it applied to making artificial skins. His Honour reserved the costs, giving the plaintiff leave to bring any action he might be advised, and directed an inspection of the modes of working by the defendants and plaintiff.		

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B.		
Bickford et als. *v.* Skewes	449	1 Q. B., 938; 4 My. and Cr., 498; Webs. R., 211—214.
————————	453	
————————	454	

This patent was taken for improvements in the apparatus used for igniting the powder in blasting rocks, &c., which was called, "*The Miner's Safety Fuze.*" The plaintiffs filed a bill to restrain the defendant from using the invention, and an injunction was granted *exparte*. On the coming in of the answer, the defendant applied to the Court to have the injunction dissolved, on the grounds, that the plaintiffs did not invent the particular manufacture, but purchased the invention from an Irishman, whose name was unknown to the defendant; that there had been no long enjoyment by the plaintiffs, and that the bill and specification left it in doubt whether the patent was for the fuze or for the machinery for making the fuze.

The Vice-Chancellor.—The Court sets the fact of enjoyment against the legal objection either of the badness of the specification or the fact of the patentee not being the inventor. The principles on which the Court acted in these questions was fully laid down in *Hill* v. *Thompson*. In this case there has been exclusive enjoyment for a length of time under the patent; that would be, *primâ facie*, such a circumstance as would bind the Court to recognise the question of injunction, either in granting it or dissolving it. I find the patent was sealed in September, 1831, an injunction was granted by the Lord Chancellor in September, 1837, and no attempt is made to dissolve it until Feb., 1838; and then the attempt, such as it was, has been allowed to continue a sort of meagre existence from month to month, while affidavits are put on the file.

His Honour retained the injunction, but put the plaintiffs on terms to bring an action to try the validity of the patent.

From this order the defendant appealed.

The Lord Chancellor.—In matters of this kind an injunction is granted or refused by the Court, as the case may be, until the right has been established at law. If the patentee has been long in

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Names of Cases.	Reported Page.	Where reported in other works.
possession of his patent, the Court will not disturb the title thereto, but give credit to it till the patentee has had an opportunity of establishing his right at law. I cannot acquiesce in the statement at the bar, that the Court gives up all protection to the plaintiff where an action has been directed to be brought by him to prove his right, although it might have been reasonable, when the defendant was restrained from infringing the patent, to compel the plaintiff to proceed as quickly as possible to try his right at law, yet the Court ought not to place the plaintiff at risk and inconvenience if the defendant had conducted himself in such manner as to have caused the pressure complained of. The plaintiff had enjoyed his patent six years before the injunction was granted; the defendant acquiesces in the injunction granted for a further period of sixteen months, and if the defendant had not been guilty of delay, the plaintiff might have had reasonable time. His Lordship retained the injunction, and refused, under the circumstances, to direct a trial to be had in Devonshire at the next assizes.		
Bleaden, Galloway, et al. *v.*	567	
Bodmer's Patent, *in re*	422	2 Mo. P. C. C., 471; Webs. R., 740.
The patentee applied, by petition, to extend the period for which the letters patent were granted in 1824. The petition was presented in May, 1838, and a caveat had been entered. Their Lordships appointed August 17, 1838, for hearing the petition, on which day a sufficient number of their Lordships did not meet to form a Court, and November the 28th was next appointed: and the Attorney-General (Sir J. Campbell) objected, on the part of the Crown, that the letters patent had expired. Their Lordships were of opinion, that the words "prosecuted with effect before the expiration of the term originally granted in such letters patent," required something more to be done than the presentation of a petition. The application was refused.		
Boulnois *v.* Mackenzie	406	4 Bing. N. C., 127; 3 Hodge, 251; 5 Scott, 419; 6 Dowl., 215; Webs. R., 260.
In this case the defendant filed notice of objections in the language of the pleas, and an application was made to a Judge in chambers for further and		

Names of Cases.	Reported Page.	Where reported in other works.
better objections; and his Lordship directed the defendant to give further objections, stating the names and addresses of the persons who had previously used the invention, and also the parts of the specification which were said to be insufficient. The defendant gave further objections, setting forth the parts of the specification which were insufficient, and the name and address of one person who had previously used the invention. Application was made to the Court to dismiss the rule of the Judge in chambers, and to retain the objections as first given. The rule was made absolute to rescind his Lordship's order, so far as it required the names and addresses of the parties who were said to have used the invention before the date of the patent.		
C.		
Chanter *v.* Leese et als.	422	4 M. and W., 295; 1 Horn and Hurlstone, 224.
The parties in this case had entered into an agreement, reciting that the plaintiff was possessed of several patents, and it was agreed, for the consideration mentioned, that the defendants should have the exclusive right in the patents, except as to certain towns, the defendants paying 400*l.* per annum, and 5*s.* per horse-power, for all boilers made or fitted according to the patents, and other payments were to be made under some of the patents. The action was for 200*l.* for the first half-year. The declaration set out the agreement, the breach being the non-payment of the 200*l.* The defendants pleaded, that the invention for boilers was not new at the granting of the patent, and that the invention for furnaces was not invented by the patentee. To these pleas the plaintiff demurred specially, because the pleas did not answer the whole of the first count, and that the matter, if true, only tended to invalidate part of the patents. Their Lordships ruled that there having been no acceptance or use by the defendants, the pleas were good, and avoided the whole contract.		
Cornish and Sievier *v.* Keene et al. .	314	3 Bing. N. C., 570; 2 Hodge, 281; 4 Scott, 307; 6 Rep. Arts, 4th S., 102.
This patent was for a manufacture of three descriptions of elastic fabrics, by		

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peculiar modes of weaving when yarns of india-rubber were used. The defendants were said to have infringed one wherein it was claimed to make elastic webs by combining covered elastic threads and non-elastic threads in the same plane, the effect being, that the non-elastic threads restrained the extent of elasticity of the elastic threads, and lighter elastic fabrics could be made than when using all elastic yarns in the warp. Evidence was given, on the part of the defendants, of several instances of previous making and using like descriptions of manufactures by other parties. His Lordship, in summing up, said,—"Now it will be a question for you gentlemen to say, whether, upon the evidence which you have heard, you are satisfied that the invention was or was not in use and operation at the time the letters patent were granted? It is obvious that there are certain limits to that question; the bringing it within that precise description which I have just given, must depend upon the particular facts that are brought before a jury. A man may make experiments in his own closet for the purpose of improving any art or manufacture in public use: if he makes these experiments and never communicates them to the world, and lays them by as forgotten things, another person who has made the same experiments, or has gone a little further, or is satisfied with the experiments, may take out a patent and protect himself in the privilege of the sole making of the article for fourteen years; and it will be no answer to him to say that other persons before him made the same experiments, and therefore that he was not the first discoverer of it; because there may be many discoverers starting at the same time, rivals that may be running on the same road at the same time, and the first which comes to the Crown and takes out a patent, it not being generally known to the public, is the man who has a right to clothe himself with the authority of the patent and enjoy its benefits. That would be an extreme case on the one side, but if the evidence that is brought in any case, when properly considered, classes itself under the description of experiments only, and unsuccessful experiments, that would be no answer to the validity of the patent. On the other hand, the use of an article may be so		

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general as to be almost universal. In a case like that you can hardly suppose that any one would incur the expense and trouble of taking out a patent. That would be a case where all mankind would say, 'You have no right to step in and take that which is almost in universal use; for that is, in fact, to create a monopoly to yourself in this article, without either giving the benefit to the world of a new discovery, or the personal right to the value of the patent to which you would be entitled from your ingenuity and from your application.' Therefore it must be between those two (if I may so call it) limits that cases will range themselves in evidence; and it must be for a jury to say whether, supposing those points to be out of the question in any particular case, evidence which has been brought before them convinces them to their understandings that the subject of the patent was in public use and operation at that time,—at the time when the patent itself was granted by the Crown. If it was in public use and operation then, the patent is a void patent, and amounts to a monopoly; if it was not, the patent stands good. Now, gentlemen, you will have to apply your understanding to-day to the evidence in this case, which is in many parts contradictory,—in order to see whether you bring the case within the one or the other of these two descriptions, and whether this patent is or not a new invention." The jury found a verdict for the plaintiffs. Subsequently a rule was obtained to enter a nonsuit; for a new trial, the verdict being against evidence, and by reason of the discovery of new evidence; also for misdirection. The new evidence consisted of a specification of a previous patent. The specification now relied on had, however, been enrolled subsequent to the sealing of the plaintiffs' patent. Their Lordships held as follows:—The invention claimed consisted of combining covered elastic strands and non-elastic strands in the same plane; by thus combining the strands of india-rubber with yarns of cotton-flax and other non-elastic material the patentee was enabled to produce a cloth which should afford any degree of elastic pressure according to the proportions of the elastic and non-elastic materials. Now, the first objection made to the patent so described is, that the invention is not the subject-matter		

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of a patent; that it is neither a new manufacture nor an improvement of any old manufacture, but is merely the application of a known material in a known manner to a purpose known before. The question, therefore, as to this point, is, does it come under the description of "any manner of new manufacture?"—which are the terms employed in the statute of James. That it is a manufacture can admit of no doubt; it is a vendible article, produced by the art and hand of man; and of all the instances that would occur to the mind when inquiring into the meaning of the terms employed in the statute, perhaps the very readiest would be that of some fabric or texture of cloth. Whether it is new or not, or whether it is an improvement of an old manufacture, was one of the questions for the jury upon the evidence before them. The materials, indeed, are old, and have been used before, but the combination is alleged to be, and, if the jury are right in their finding, is new, and the result or production equally so. The use of elastic threads, or strands of india-rubber, previously covered with filaments wound round them, was known before; the use of yarns, or other non elastic material, was also known before; but the placing them alternately, side by side, together as a warp, and combining them by means of weft, appears to be new. It is a web combining the two qualities of great elasticity and a limit thereto.		
Their Lordships thought that, the evidence on both sides having been carefully listened to and weighed by the jury, there was no reason to disturb the verdict.		
Their Lordships also said, with regard to the third ground upon which the rule *nisi* was granted, viz., that since the trial the defendants have discovered a patent taken out by one Desgrand, the patent being sealed in November, 1832,—We think it sufficient to observe, that this specification was not enrolled till May, 1833; whereas the article made under the plaintiffs' patent was publicly made and sold in the London market, to a very large extent, in March and April of the same year. And, although the specification of Slevier's patent was not enrolled till July, 1833, we think the mere fact of the enrolment of Desgrand's specification (after the plaintiffs' patent was sealed and his discovery known in		

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the market) does not of itself alone afford any proof whatever of the want of novelty in the manufacture made under the plaintiffs' patent.—Rule discharged.		
Crane *v.* Price et als.	611	4 M. and G., 580; Webs. R., 377, 393; 18 Rep. Arts, 4th S., 102.
———————	669	
This patent was taken for improvements in the manufacture of iron, and the claim to invention consisted of the use of hot-blast in combination with anthracite or stone-coal, the specification disclaiming the use of hot-blast separately, and also the separate use of anthracite or stone-coal. The use of hot-blast was claimed generally by Mr. Neilson under a previous patent, and the plaintiff, on taking his patent, obtained a license from Mr. Neilson for the use of hot-blast. The defendants had also a license from Mr. Neilson, and had long been making iron by the use of coke of bituminous coal subsequent to the granting of the plaintiff's patent. The defendants proceeded to use one-third anthracite and two-thirds coke of bituminous coal in combination with hot-blast. For the defendants it was contended, that a patent could not be valid which required the use of another patent; and that the combination of anthracite, or stone-coal, with hot-blast in making iron was no manner of new manufacture. At the trial a verdict was taken for the plaintiff on the evidence given, subject to the questions being argued before the Court as a special case. Their Lordships held, that if the result produced by such a combination (hot-blast and anthracite) is either a new article, or a better article, or a cheaper article to the public, than that produced before by the old method, that such a combination is an invention or manufacture intended by the statute. (*The King* v. *Wheeler; Hill* v. *Thompson.*) There are numerous instances of patents which have been granted where the invention consisted in no more than in the use of things already known, and acting with them in a manner already known, and producing effects already known, but producing those effects so as to be more economically or beneficially enjoyed by the public. (*Hall* v. *Boot; Derosne* v. *Fairrie; Hill* v. *Thompson; Rex* v. *Daniell.*) It was objected, in the course of the argument, that the quantity or degree of		

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invention was so small that it could not become the subject-matter of a patent. But we think, if it were necessary to consider the labour, pains, and expense incurred by the plaintiff in bringing his discovery to perfection, that there is evidence in this cause that the expense was considerable and the experiments numerous. But, in point of law, the labour, thought, or experiments, and the expenditure of money, are not the essential grounds of consideration on which the question whether the invention is or is not the subject-matter of a patent ought to depend; for if the invention be new, and useful to the public, it is not material whether it be the result of long experiments and profound research, or whether by some sudden and lucky thought or mere accidental discovery. As to the first issue, namely, whether the defendants have infringed the patent, we think it clearly appears on the evidence, that the defendants have used, either in part or in the whole, the combination described in the specification. Now, it is further argued, that in point of law no patent can be taken out which includes the subject-matter of a patent still running, or in force. No authority was cited to support this proposition; and the case, which was before *Lord Tenterden*, and in which he held, that where an action was brought for an infringement of improvements in a former patent granted to another person, and still in force, that the plaintiff must produce the former patent and specification. That, at least, affords a strong inference that the second patent was good. (*Lewis* v. *Davis*.) The case of *Harmer* v. *Playne* is a clear authority on the same point, and upon reason and principle there appears to be no objection. The new patent, after the expiration of the old one, will be free from every objection; and, whilst the former exists, the new patent can be legally used by the public by procuring a license from Neilson, or by purchasing the apparatus from him or some of his agents; and the probability of the refusal of a license to any one applying for it is so extremely remote, that it cannot enter into consideration as a ground of legal objection.—Judgment for the plaintiff.		
Crofts *v.* Peach et al. . . . . . . An application was made on behalf of	233	2 Hodges, 110; Webs. R., 268.

Names of Cases.	Reported Page.	Where reported in other works.
the defendants in an action for infringing a patent taken by the plaintiff for improvements in the manufacture of lace, that the plaintiff should hand over to the defendants specimens of the lace made by the plaintiff's machine, in order to enable the defendants' witnesses to show that it was old, and also that that made by the defendants was not like the plaintiff's manufacture. *Chief Justice Tindal.*—The effect of this application is to ascertain the evidence which the plaintiff will produce at the trial. The defendants may plead that the invention is not new, if that be the fact. The specification gives the necessary information.		
Curtis et als. *v.* Cutts	430	8 Law Journ.
In this case an injunction had been granted by the Vice-Chancellor, who refused to dissolve the same on the coming in of the answer. The defendant appealed from the decision. The bill did not set out with any clearness what had been done by the defendant, but generally stated that he had infringed the patent. *The Lord Chancellor.*—The bill does not state such a case as to justify the granting of an injunction; but the answer does state that which, if stated in the bill, would have entitled the plaintiffs to an injunction as regards their title. There are, however, other statements contained in the answer which throw doubt on the right of the plaintiffs to the injunction prayed by them. The answer disputes the validity of the patent, and states that the invention is not new, and that the specification is imperfect. On the other hand, the plaintiffs contend that there has been a long possession and enjoyment under the letters patent of 1825. This Court gives credit, no doubt, to long enjoyment under the letters patent, until it is proved that they are bad; but then there must be not only enjoyment, but exclusive enjoyment under them. The question is, whether in this answer such a case is admitted. The answer states, that the plaintiff, Parr, when not interested in the patent, had made a machine upon the principle claimed by the letters patent, and insisted that the letters patent were not new. The defendant shows that, by the exercise by the plaintiff, Parr, when not interested in the letters patent, and by the defendant since,		

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is inconsistent with the exclusive right of the plaintiffs; and not only negatives exclusive enjoyment by Dyer (the patentee) and the plaintiffs, but shows that the title of the plaintiffs was disputed by the very party who now sets up exclusive enjoyment. If the difficulty had been only the generality of the statement in the bill, I should have supported the letters patent; but the allegations in the answer negative the exclusive enjoyment claimed by the plaintiffs. His Lordship dissolved the injunction, giving the plaintiffs liberty to bring an action, or to make a new application in another case, as there was no doubt from the answer that the defendant was infringing the patent.—Costs reserved.		
Cutler's Patent, *in re*	523	4 My. and Cr., 510; Webs. R., 418.
This was a petition to the Lord Chancellor, that letters patent should pass the great seal, notwithstanding a *caveat* had been lodged against it. His Lordship referred the petition back to the Attorney-General, who, on hearing the parties, decided that the inventions were not similar; and the Attorney-General stated that he would so report to the Lord Chancellor. But the opposing parties requested a further hearing, in order that they might have an opportunity of showing that the petitioner's invention was old. Mr. Attorney-General granted the further hearing, and reported to the Lord Chancellor that the petitioner's invention was old. On this decision an application was made to the Lord Chancellor to seal the patent. His Lordship examined the invention, and also that said to be similar to it, and which had induced the Attorney-General to report that the invention was old; and his Lordship directed the patent to be sealed, and the opposing parties to pay the costs.		
Cutts, Curtis et als., *v.*	430	
D.		
Dewick et al., Fisher *v.*	416	
Downton's Patent, *in re*	522	Webs. R., 565; 12 Rep. Arts, 4th S., 105.
This was an application by the widow of the patentee to extend the term of letters patent, and their Lordships re-		

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ported in favour of extending the period for which the letters patent had been granted. Application was also made that their Lordships should allow costs as against the opposing party, which was granted; their Lordships remarking, that the Attorney-General appeared for the Crown and the public.		
E.		
Erard's Patent, *in re*	112	Webs. R., 557; 5 Rep. Arts, 4th S., 58.
This was an application under the statute, that the term of the letters patent granted to the petitioner might be extended. This was the first application under the statute. The patent was extended for a further term of seven years. And their Lordships, in giving judgment, said, "That in all such cases their Lordships would require a strong case of hardship to be made out, as well as a strong case upon the utility of the invention."		
Everington et als., Macintosh et als. *v.*	186	
F.		
Few *v.* Guppy	235	1 My. and Cr., 487.
In this case proceedings were pending in Chancery against the defendant for infringement, who filed a cross bill, setting forth that the patent was held in trust by the plaintiff for more than five persons, and that the patent was void. The bill set out certain deeds, and alleged that, if all deeds, papers, books, and documents, relating to the trust were examined, it would be found that the patent was void, by reason of it being held in trust for more than five persons. The answer of Mr. Few admitted the possession of many books, letters, and papers, partly handed to him as solicitor, and others relating to different inventions and other private matters. The Vice-Chancellor held that the deeds, agreements, and licenses, should be produced; but that other documents, in which other persons might be interested, ought not to be produced. On appeal from this decision the Lord Chancellor directed that all those documents which related to the assignments		

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and licenses should be produced, the cross bill, as worded, not calling for anything beyond what related to the assignment and licenses. In the course of subsequent proceedings application was made for leave to file another bill for further discoveries, which the Court allowed.		
Fisher *v.* Dewick et al.	416	4 Bing., N. C., 706; 6 Dowl., 739; Webs. R., 264.
Application was made in this case, that the defendants should give further and better objections. The Court held, that where a defendant states that parts of the specification are defective or not sufficient, the parts should be stated.		
G.		
Galloway's Patent, *in re*	107	
This was an application to extend the term of letters patent for paddle-wheels. Their Lordships recommended the term of the patent to be extended.		
Galloway et al. *v.* Bleaden	567	Webs. R., 521; 13 Rep. Arts, 4th S., 220.
This was an action brought by the plaintiffs against the defendant for infringing a patent granted for improvements in paddle-wheels, which consisted in having the float-boards in parts, such parts being fixed on a cycloidal line, which would be generated by the wheel when rotating, and moved through space at the rate the vessel ought to be propelled by the power employed. The defendant used less number of parts to each float-board, but he fixed them within the line pointed out by the specification. The specification stated, that Mr. Field had made experiments previous to the patent, but had failed; and the question chiefly turned on the fact of whether Mr. Field had previously published the same invention. The jury found for the plaintiffs.		
Gillett et al. *v.* Wilby	540	9 C. and P., 334; Webs. R., 270; 13 Rep. Arts, 4th S., 121.
This patent was for improvements in public vehicles, called cabs, and consisted of so constructing such carriages that the passengers should enter in front and the driver's seat be behind. The evidence showed that the defendant had only infringed part of the invention. The declaration stated, that he had used and put in practice the improvements. On the part of the de-		

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fendant it was contended, that the infringement of part only was not sufficient. The Court held that if any part was infringed it would be enough. It was then urged, that it had not been proved that the defendant had infringed. All that had been shown was, that the defendant kept cabs, and that one like a model produced started from and returned to his yard. The question was left to the jury on the evidence, and they found a verdict for the plaintiffs.		
Guppy, Few *v.*	235	
H.		
Hague, Losh *v.*	464	
Harrison, Parkin *v.*	677	
Hicks et als., Lovell *v.*	176	
J.		
Jupe *v.* Pratt	242	Webs. R., 145, 8 Rep. Arts, 4th S., 112.
———	289	
In this case the patent was for so constructing expanding dining and other tables, that the parts composing the original table should diverge from a common centre. Various arrangements of apparatus were shown and described in the specification for moving the several sections of the original tables. The defendant did not use any of them. His table, however, consisted of angular pieces, converging to a common centre, like those of the plaintiff's patent, the means of causing the parts to move outwards, and the shapes of the filling-pieces, or leaves, employed were different, which enabled the defendant to obtain a different form of enlarged table to that shown by the plaintiff. The jury found for the plaintiff. A rule *nisi* was subsequently obtained, and the whole question was argued before the Court. It was objected, that the patent was for a principle; and, also, that the plaintiff claimed a mode of acting invented by another. *Mr. Baron Alderson.*—You cannot take out a patent for a principle. You may		

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take out a patent for a principle coupled with the mode of carrying that principle into effect, provided you have not only discovered the principle, but invented some mode of carrying the principle into effect. It was objected, that the plaintiff had included one mode of causing the parts of the original table to diverge, which had been suggested by a workman. *Mr. Baron Alderson.*—If he (the patentee) invented one mode, he may get a person to invent another. The Court held, that under pleas which stated that the invention was not new, and that the patentee was not the inventor, a defendant cannot object that the patent was for a principle. To raise that question the pleadings must be directed to such an objection.		
K.		
Kay's Patent, *in re*	168	3 Mo. P. C., c. 24; Webs. R., 568.
This was an application to extend the term of the letters patent. Proceedings had for a long time been pending in the Courts of Law and Equity, and their Lordships at first doubted whether they ought to proceed before judgment had been obtained in favour of the patent; but on finding that the patent would expire before judgment could be obtained, their Lordships proceeded and reported in favour of extending it for three years; stating that, should the judgment of the Courts be against the validity of the patent, the proceedings before them would not alter the case.		
Kay *v.* Marshall	117	1 My. and Cr., 373; 1 Beav. 535; 1 Keen, 190; 5 Bing. N. C., 492; 8 Cl. and Fin., 245; 7 Rep. Arts, 4th S., 35; 10 Rep. Arts, 4th S., 51.
————	127	
————	159	
————	165	
————	169	
This patent was taken for "*new and improved machinery for preparing and spinning flax and other fibrous substances by power.*" The claim to invention was in respect of new machinery for preparing flax, hemp, and other fibrous substances—the macerating vessels marked B, and trough of water marked C, and		

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